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Journal of the Society of Arts.

FRIDAY, MARCH 16, 1855.

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FOURTEENTH ORDINARY MEETING.

Wednesday, March 14, 1855.

The Fourteenth Ordinary Meeting of the One Hundred and First Session, was held on Wednesday evening, the 14th inst., Professor T. L. Donaldson, in the Chair.

The following Candidates were balloted for and duly elected Ordinary Members :—

Brooks, Wm. Penny
Carruthers, C. B.
Dempsey, Henry William
Greenaway, Edward
Lewis, Waller, M.D.
Macgregor, Alexander
St. André, Jules Le Chevalier
Starling, Joseph
Steibel, Isaac M.
Williamson, Alexander W., Ph. D.

The following Institutions have been taken into Union since the last announcement.

386, Radway, (near Banbury) Institution.
387, Carlisle, Church of England Religious and General Literary Association.
388, London, Camden Town Literary Institution.

The Paper read was

ON A NEW METHOD OF TEACHING DRAWING, INVOLVING THE PRINCIPLE OF A NEW SYSTEM OF ARCHITECTURE.

By Herr Joseph Kumpa, of Dresden.

Drawing, as an art, beyond its merely mechanical quality of representing external objects as they appear to the eye, is truly the language of the imagination by which the artist, the mechanic, and the designer, are able to communicate to others their ideas and conceptions. These ideas, to a great extent, until they are realised, are more or less indistinct even to the originator, and though, as they appear before the eye of the imagination, they are filled with beauty, still the contest which may be said to arise between the subtle thought and the difficulty of practically expressing it, tends so to confuse the first conception, that the finished design often wanders somewhat from the true idea, and the harmony which the fancy saw is much impaired. This it is, perhaps, which often distresses the greatest geniuses when they look upon the efforts of their skill. An innate and highly refined sense of truth and beauty will go far to correct the effect of this tendency to error, but where nature has bestowed this unfrequent gift in an inferior degree, science and education must endeavour, by their researches and rules, to supply the necessary antidote. If these researches have led to truth, and upon this truth the rules have been founded, the knowledge of them must be beneficial to all, even the most endowed, but to the majority they must be absolutely necessary. All instruction in drawing, therefore, which has for its object something more than the attainment of mere mechanical skill, should be based upon principles simple in their nature and solid in their foundation, and should tend to arouse within the pupil, and teach him to appreciate, that sense of real beauty which is necessary to the attainment of the freedom and boldness of self-reliance, without which the representation of natural or artistic objects falls to the level of mere imitation, divested alike of vigour, poetry, imagination, and originality.

We, in our present purpose, find no place for any desire to destroy any system of teaching already in existence, in order to substitute as our own a new theory, and a new development.

We have no new principles of truth to establish on the ruin of existing belief. We wish to add only to practical science any mite we may have to offer, and to assist, if it is in our power, the present endeavour to bring within the reach of the masses the means of instruction in at least the rudiments of art.

With these feelings it appears to us, that pupils, whose tuition consists for the most part in toilsomely kneading together drawings after models which are placed before them, are scarcely put in the way to attain to the essence of the art which they practice. A method by which it would be possible to conduct them by regular and natural sequence from the very simplest commencement, to more advanced drawing, assisting in the mean time the application of their thoughts to the elements of the science of what they are taught, would seem to afford the most obvious means of successfully cultivating, and possibly of creating, an artistic feeling and capability in those upon whom nature has not bestowed those powers which require for their development, opportunity only rather than encouragement. We think also that such a method would be found of great advantage when applied to the talented, in correcting many whims and unfortunate biases into which the best are apt to be betrayed when first beginning to learn, and whose effects are afterwards apparent even in their finest works.

As the result of reasoning similar to the foregoing, we wish to be permitted to present, with some confidence in its success, the following system of tuition, for the proper understanding of which we apologise for drawing attention to some preliminary remarks of a sufficiently elementary and obvious character.

The first thing, of course, in teaching drawing is to teach the pupil to draw a straight line, and with this first step the first difficulty presents itself. We are speaking at present rather of those who have no particular facility for the art. The importance to the pupil of learning to accomplish this first necessary with a firm delicate and sure touch, and in any direction, need only be alluded to. Every one also engaged in teaching knows that in practice it can scarcely be obtained with the majority. The student is set to the drawing of many strokes, first in one direction, then in others; but the lesson is so tedious, (and precisely so in the inverse ratio of the child's talent) that it has to be immediately abandoned, at the risk, at the outset, of arousing in place of taste, a most unconquerable dislike for the new occupation. The beginner is at once carried on to subjects more interesting, but on that account less likely to be accomplished, and the disappointment of early failure is only less dangerous than the disgust of dreary drudgery. Moreover, as most school drawings shew, this first deficiency still clings to the pupil even after much progress, and while it spoils the effect of his own drawings it engenders a lax and inattentive taste with regard to art in general.[*] Our first attention has, therefore, been directed to this point, and by combining the lines which the tyro has to draw, without destroying the simplicity of the lesson, we believe (and some experience has confirmed our belief) that we have succeeded in lending to the study sufficient interest to enable it to be insisted upon.

By our arrangement the student, as soon as he can accomplish a line only decently straight, without much regard, at first, as to the way in which he makes it, is told to copy a square, which, when done, he divides by lines into quarters, diagonals, and various mathematical figures, rapidly advancing into figures of some complication, curiosity, and beauty; proceeding from straight lines to arcs and curves, and eventually into some practice in the use and combination of the elementary colours. During all this time he is carefully practising the drawing of the lines in every position, which the mathematical nature of his copies is continually urging him to delineate correctly; his appreciation of angles, power of measurement, and sense of form and beauty, being also fostered and developed. This may be said to be the principle in outline to which we invite a closer attention in the following details :—

The art of drawing, and particularly that branch which is termed free-hand drawing, requires that, from the commencement of its study, three truths should be kept in view. That proficiency mainly depends,

First—On the power of accurately appreciating the form, colour, and character of the subject represented.

Second—On the acquisition of ready dexterity in manipulation.

Third—On the extent to which the imagination has been improved and educated, and a taste for the beautiful developed.

These three truths, it seems to us, should be attended to from first to last, through all the steps of progress; and, we think, that that system must be the best which most constantly maintains them in sight. At first, as we have implied before, the education of the hand presents the earliest, and a great difficulty; but, bearing in mind that all forms in nature and art must be composed entirely of lines straight and curved, we have insisted that these lines should form the substance of a student's first lessons. We have said, too, that if progress is to be obtained these lessons must be made interesting. For this purpose, instead of a book, or a box, or any other usual object which possesses neither interest nor any further utility for study than the immediate difficulty of drawing it (which is sometimes almost a disadvantage), we take a square, Fig. 1, for the beginner to copy, as one of the simplest of all possible figures. When the pupil can draw this tolerably, he adds to it diagonals, as at Fig. 2; he then draws Fig. 3, upon which he further constructs Fig. 4, Fig. 5, and so on, as an examination of the diagrams on the walls will render evident. It is apparent that these studies are extremely simple, and, therefore, suitable to the beginner—to whom they not only present an appearance of purpose, but fulfil the purpose by offering variety and continual progress, which is gratifying to the mind, and stimulates the curiosity of the student. The natural sequence, moreover, by which each figure follows upon its predecessor, prevents those abrupt occurrences of difficulty which distress the beginner with failure. This advantage also accrues, that, every figure being mathematical, the proportions are apparent, and the laws which govern them gradually show themselves, and become fixed in the memory. A taste for proportion and harmony is awakened, and the angles and lines which best assist in producing them are ascertained, together with the means of constructing them. The early habit, too, of dealing with angles and mathematical proportions, of estimating them with the eye, and having false estimates detected by the working of the figure, and by the same means the rectification shown, will, we think, be found of very great advantage when the pupil has advanced to sketching from nature and art. Nor is the imagination left without its stimulant. As the proficiency of the student progresses, the learner will find his power of combination roused into activity, as he discovers how easy it is to invent fresh forms, and is tempted to exercise his ingenuity in arranging them for himself. Provided that the master is careful to insist on the lines, angles, and distances being accurately drawn, no danger to the taste or progress of the pupil is to be apprehended from such attempts at originality, for the mathematical nature of the drawing prevents the possibility of false proportions or bad harmony—the worst error to which he is liable being poverty of invention. On the other hand, this poverty will be best consulted by this very practice, and confidence and self-reliance especially fostered by it; so that we would certainly recommend the teacher to applaud and encourage such attempts to a reasonable extent.

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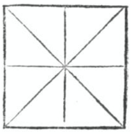

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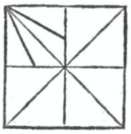

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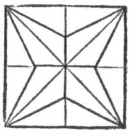

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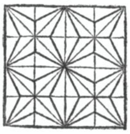

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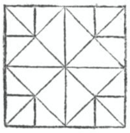

From straight lines, and their combinations, the pupil proceeds to curves, as will be seen by reference to Figs. 8, 9, and 10. The points fixed by the intersections of lines, and otherwise naturally indicated, will suggest the proper dimensions and character of the curves, and, assisted by them as guides, the pupils will readily learn to delineate circles, spirals, and curvilinear ornaments, with a ready, free, and bold hand; while his sense of beauty and proportion will continue to receive the same species of encouragement as we have explained with reference to straight lines. The figures drawn by these means, especially the more complicated, may be made very useful for the purpose of explaining to, and practising the pupil in the use and combination of colours; but, as this has more particular reference to another branch of the subject, we will return to it at greater length further on.

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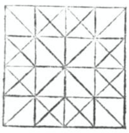

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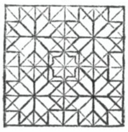

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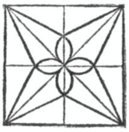

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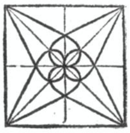

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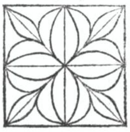


It appears, we would submit, from what we have now shown, that, by the method of teaching here explained, important advantages are gained. Not only is it rendered possible to educate the hand at the outset in a way hitherto unattainable, but, in the meanwhile, the pupil receives a mental training exceedingly well calculated to set his after acquirements on a good and solid basis. His eye is trained, his hand practised, and his imagination roused, by a process at once simple, interesting, and effective. It is not, however, to be supposed that this system renders it by any means necessary to abandon the means at present used. We offer our suggestions, as we commenced by saying, as additions to existing methods, and as calculated, also, to be beneficial when no other means would avail. Our proceedings are evidently intended to conduct the learner to that proficiency of hand and eye which will fit him for studying nature. But the master is, of course, at liberty in the exercise of his discretion, and without injuring in any way the effect of our plan, to vary the routine by introducing natural objects, as at present customary, as early as he may think proper, as well as occasionally to cause his most advanced scholars to revert from their studies from nature to a little of our practice. It will, indeed, we think, be advantageous to cause the pupil to pay more or less attention to these elements, according as the ultimate direction of his studies should become mechanical, architectural, or artistic. It may be observed, also, that it is not essential that the form of the square should be rigidly adhered to, as any symmetrical figure of mathematical construction will be found to possess similar qualities; a square, however, will, we think, prove for general purposes the simplest and most convenient. Having conducted the reader thus far in the elucidation of our proposal, we would wish to offer some observations as the result of our experience, as to the best method of proceeding upon our theory in the instruction of a class.

MODE OF INSTRUCTION.

The class being formed, the teacher should be supplied with a black board, and the students with paper of a coarse description, sufficiently large to admit of a square of six to twelve inches diameter being drawn upon it. A slate, however, might be used in the first instance in poor schools, where paper is too costly. The pencils should be charcoal, which has the double advantage of marking with a small pressure and of being easily obliterated; by which the pupil is compelled to a light and free touch, and much paper will be saved. If the paper, also, is hard and well glazed, it may be washed and re-used more than once; and if of a blue or grey tint, will not so strongly show the traces of former obliterations, and will, therefore, last longer without washing. If possible it should be stretched on a frame, and the method we shall propose will be found to admit of this without much delay or inconvenience. All being thus prepared the master proceeds to draw successively on the board the figures 1, 2, 3; the Fig. 4 may be said to be a result of the preceding. Figs. 5 to 10 are developed in a similar manner. Pupils copy after him. After a time it will be sufficient to hang on the board the originals, and after further progress the class may be required to finish for themselves designs which in the original are left incomplete.

The pupils should be obliged, in the first instance, to make a rough sketch as freely, lightly, and accurately as possible; the charcoal should then be whisked off with a handkerchief, leaving the lines faintly perceptible, and upon these traces the drawing should be finished.

The master should, of course, be very constant in his attention to each student, and insist upon the proportions being accurately preserved, and the lines firmly, equally, and boldly drawn. When the teacher is satisfied with the drawing the charcoal may be removed, and the paper will serve without washing for several drawings. In all classes some pupils will always progress rapidly, and others be laggards; and in teaching a number this always constitutes a difficulty. The mathematical basis of this system, however, gets over this obstacle effectually, for when the best pupils have satisfactorily accomplished one example, the addition of a few lines furnishes them with fresh occupation, without destroying the use of the figure for the rest. At such times also they may very properly be encouraged to exercise their invention, as has been before explained. The spirit of emulation will, moreover, be augmented by this means. At the end of each quarter, or year, proof specimens of the pupils' progress should be prepared, and these will be found usually to give the following results: If there be several classes formed, to keep together those who have started together, then the lowest class will show the greatest difference between the good and the indifferent, the former, however, preponderating. As the classes rise, the backward will approach nearer to the more quick and clever, until in the highest class, the distinction will consist only in the air of decision and ease which the best drawings will exhibit.

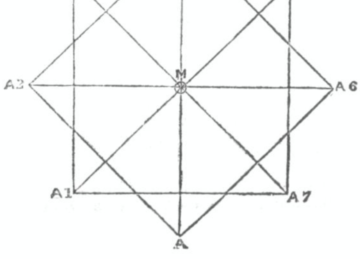
In concluding this part of the subject, we would observe, that it is intended to publish, in separate numbers, a series of drawings with appropriate directions, in accordance with this system. These drawings will constitute a complete course of instruction in the combination of straight and curved lines, with ornamental designs, passing into studies from models and nature. To this course will be annexed a certain number of drawings from mediæval art, which cannot fail, by their beautiful proportions, pure feeling, and elegance of design, to be of great utility in illustrating and assisting the principles upon which this system proceeds, and in fostering that correct and fervent taste of which the originals are the glorious result. When to these are added copious instructions on the laws and practice of aerial and linear perspective, we hope to have presented to the public a work capable of adding somewhat to the means already in existence for promoting the diffusion of that refined and artistic feeling which those who appreciate the softening and elevating influence of truth and beauty desire so earnestly to establish.

We beg, however, particularly to draw attention to the circumstance that this system is principally intended for the education of those engaged in manufactures and the arts of design connected with them. The progress of the natural sciences of late years, the enormous extension of industry, and the necessary consequences upon the social condition of man deeply affecting his mental and bodily welfare, have opened up a rich and unbounded field for investigation. Industry has been directed to the investigation of nature, and has sought to solve the problem of how to turn the laws and forms of natural phenomena into channels which will render them subservient and useful to man. To attain this high object it was necessary that natural sciences should be cultivated with particular attention. Everywhere colleges and schools have been erected for the principal purpose of giving instruction in these branches of human science, and are contributing to its further development. Out of this has arisen the art of drawing, which has been found to be an indispensable sister science of natural philosophy, and it soon became evident that the methods hitherto adopted for the purpose of instruction did not satisfy the claims made upon them, and that a thoroughly systematic reform and reconstruction of the method of drawing and teaching drawing was called for.

ARCHITECTURAL SCHOOL.

As we think that those whose instruction in drawing is directed to the object of preparing them for architectural studies should be more rigidly trained than others in the principles of proportion, and should have their appreciation of precision and symmetry more perfectly disciplined, we have considered it advisable to prepare for their use a more extensive and methodical system of linear tuition, in which free use can be made of rule and compass. For this purpose, we divide this portion of the subject into several parts, to the first of which, as relating to the diagrams which we shall have occasion to use, we beg now to draw attention.

These differ little from those which have already been explained, being a variety of progressive figures developed with right lines and arcs on the basis of the square; but to understand them properly, with the key to the construction of each, we must explain that we have adopted in teaching a convenient method of lettering the diagrams, giving all the points which are used in their formation letters of the alphabet, according to their distance from the centre, all those equally distant being marked with the addition from left to right of small numerals, as a, a^1, a^2, &c., Fig 11; and b, b^1, bb^2,&c., Fig 12.



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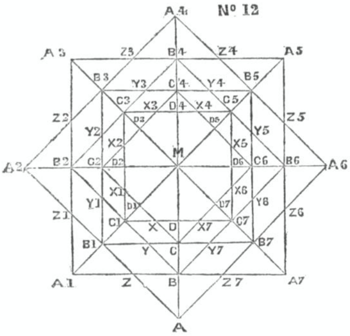
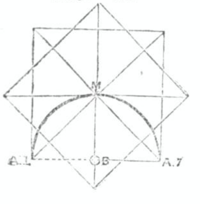


By this simple means, if a figure (as Fig. 16) be constructed by taking successively as centres *b*, b^1, b^2, &c., and $b\ a^1$, $b\ a^2$, $b^2\ a^3$, &c., as radii, as represented in figs. 13, 14, 15, 16, then *b a*, may be said to be the formula, or key of that figure, the first letter signifying always the centre, the second in combination with the first determining the radius of the circles which compose it, which radius is also further distinguished in the plates by a line *a b*. In this way, given such a figure as Fig. 11 as a base, and being told to complete a diagram with either *b a*, or *a b*, or *a m*, or *m a*, as formulæ, the student can construct the drawing without further assistance.

B_A 13



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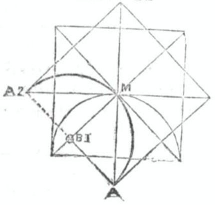

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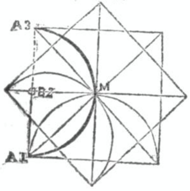

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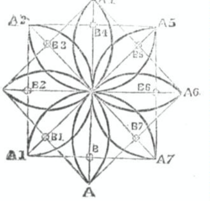
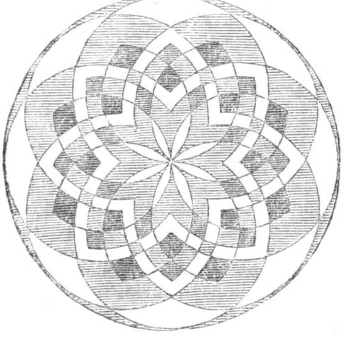


Part II. treats of rectilinear and curvilinear figures on a plane, tinted in such a manner as not to give the effect of raised surfaces. These figures are combinations of the elementary figures of the diagrams as shown in Fig. 17.

K_Z.B&K N° 17.

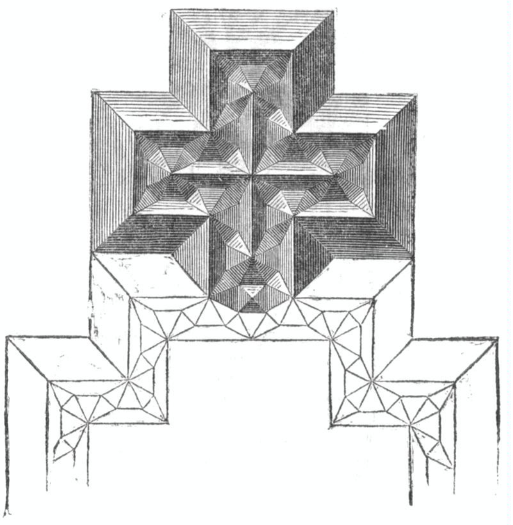


Each individual field, as it may be termed (vide Fig. 17) of a drawing in outline, is treated with a uniform tint of colour, or at first merely with an equal shade of Indian ink. In this manner the deep tints are produced by laying one coat of the original tint over the others, and may be deepened by successive coatings, as the pupil progresses in the management of tints. This has the advantage of practising the pupil in the use of the brush or camel-hair pencil, and in the management of colours. These figures can be beautifully executed in colours, the attraction of the colours at the same time increasing the interest of the pupil.

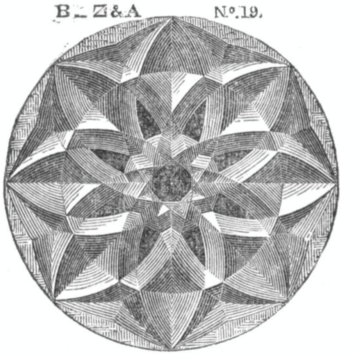
By these drawings the pupil is practised in the harmonic combination of tints on a plane, which is of importance in architecture, mosaics, the printing of cotton, silk, velvet, paper, woven fabrics, &c.

Parts III. and IV. give the application of the elementary figures of Part I. Both represent bodies described by planes, and bodies described by planes and curved plans as shown in Figs. 18 and 19.

L N° 18



B _ Z & A N°.19.



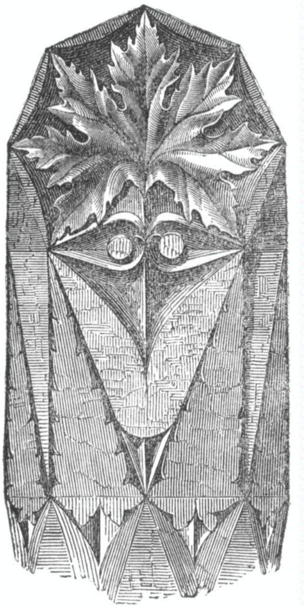
These figures, the elements of which are contained in the diagrams on the wall, seem at first sight to be difficult of construction, but a little attention will show them to be simple and easy. The formula, with which each figure is headed, gives at once the key to its design or construction. Fig. 19, for instance, is constructed similar to Fig. 16. This portion of the system is specially applicable to architecture, the different branches of industry, and the mechanical arts.

Part V. consists of drawings representing an entire edifice, with some of its important details, which we desire to offer as a result of the development of the system; being, we believe, new as to style, construction, feeling, and principle.

We by no means put forth this design as the final result of what we hope to accomplish, but as a proof rather that the proposal which we make offers a means of directing thought into a new and original form of expression, which may happily lead to the production of that desideratum of modern art, a fresh scientific and inexhaustible style of architecture, which may prove to be as well adapted to the varied requirements of modern society as were the arts of Greece, Grenada, and Gothic Europe, to the times in which they flourished.

The diagram on the wall exemplifies the method of construction for an architectural design; a similar example is shown in Fig 20. In this section also we endeavour to show how the forms of nature, without being conventionalised, may combine harmoniously with geometrical forms, and without sacrificing their utmost purity; the geometric shape constituting, as it were, the frame which serves more perfectly to set off the exquisite perfection of nature's moulding. In this portion of study, the pupil's attention is of necessity carefully directed to natural objects, as leaves, of which in our system he will have constant and important use.

Fig. 20.



A little consideration of the Parts II. to V. will serve to demonstrate the mode by which designs are developed, and, at the same time, will convince, we think, every one, that the variety of form, expression, and direction which such designs may take is perfectly inexhaustible, and requires only the genius of invention to produce rich and beautiful effects.

Instructions in embossing, moulding, and intaglio, forms an integral portion of our system. The method pursued for this purpose is similar to the preceding, working from the simple elementary forms upwards through the various gradations, till thorough efficiency is reached. The rigid mathematical education of the hand and eye will here be found to be of the most essential advantage, as the principles inculcated will be of constant application.

These observations close the explanations which we have thought it necessary to give in order to convey a sufficient idea, in as condensed a form as possible, of the method of teaching which we propose for consideration. It is directed, as will have been seen, upon the principles with which we started, of keeping constantly in view, in all manner of instruction, the groundwork and secret basis upon which all symmetry, and truth, and beauty of form and combination depend.

We hope to have convinced all whose candid feeling of genuine interest in the successful attainment of those objects, to which we among many others have endeavoured to direct our exertions, that by the alliance of interest with method, we have succeeded in suggesting a means by which many, at least, of the difficulties heretofore experienced in the way of popular tuition, may be smoothed away, and a truly artistic feeling fostered and developed, where at present alone exist unreasoning apathy and ignorance. If we have done this, we are rewarded by the conviction that to us will belong the happiness of having materially assisted in bringing into healthy action those feelings and sentiments, whose influence upon individuals and nations are among the best calculated to secure the peace, content, happiness, and civilization of mankind. Surely the day will be a fortunate one for England, when the masses can wander among the beauties of Sydenham, and applying to the objects around them the simple rules which all have been taught to appreciate, can estimate each perfection with a certain measure of the delight which at present attends the steps only of the few. It is for this end that our system has been originated, and with this desire that these remarks have been penned.

DISCUSSION.

After the reading of the paper, Mr. P. Le Neve Foster, the Secretary, stated that he had received three communications, one from Mr. R. Redgrave, R.A., one from Mr. G. Wallis, and the third from Mr. D. R. Hay, of Edinburgh.

Mr. R. Redgrave, R.A., after regretting that he was unable to attend at the reading of Herr Kumpa's paper, proceeded to say that he did not doubt it would be "the means of diffusing much useful information on the cultivation of invention, and a power of drawing and designing. The method, however, is not new in this country; it has largely been practised by many teachers, although, perhaps, not so systematically as is advocated in the paper. It is practised in some of our local schools exactly as described, and I have seen it in use in the Home and Colonial Training Schools. It has many advantages when not carried out to the exclusion of other practice. Geometrical forms, as the structure and the production by means of such forms, of the symmetrical ornament, has ever been the basis of the teaching in the Government Schools of Art; and all the early lessons in the excellent drawing-book produced by Mr. Dyce, in 1842, for these schools, are based on geometry and symmetrical forms, and the pupils' interest in the lessons, stimulated by the practice of invention in some cases—as in the lessons of Herr Kumpa. The black-board instruction recommended by the professor is now practised largely by our masters in training or teaching pupils in parochial schools, and in many instances the production of symmetrical patterns by repeats, forms the subject of the lesson, although much varied with drawing objects and utensils with which the children are familiar; since it is found that they are apt to tire and weary of abstract forms, which, even if they could render them beautiful, appeal but little to their minds. Moreover, the advanced students in our schools have their inventive faculties stimulated by an exercise almost precisely similar to that recommended by Herr Kumpa, and it forms a particular stage in the course of instruction. A geometrical form is given, and a natural object (flower or foliage) as the unit for repetition, and the students in all schools are required to arrange it symmetrically in the given space, both as to form and as to colour. I enclose you the prize-list for 1854. At page 2 of this list you will find the given form—the floral motive for that year;[*] and, in the report on the awards in that year (which I also enclose) you will, at page 9, see the examiners' report on the results, and their opinion on its utility.[†] From these remarks you will be aware that I have a favourable opinion of Herr Kumpa's method—if it is not used to the exclusion of other means—and shall hail with much pleasure a careful manual on the subject."

Mr. George Wallis, (Government School of Art, Birmingham,) says, "I send you a few proofs of the truth of Herr Kumpa's plan of elementary instruction, as it has been pursued in the branch elementary school attached to the Birmingham School of Art during the last twelve months. The drawings I send have been all executed in the regular course of study, chiefly by students who have not been in the class more than three months. Had it been worth while I could have sent diagrams, identical line for line with Herr Kumpa's, which have been used there during the period above named. In fact, the method propounded is the same as that now followed in all the Elementary Drawing Schools in connection with the Department of Science and Art, and my practice as a teacher has been based upon an analogous principle for 14 years past. Of its value as a preliminary course of training there can be no doubt. The student can always prove for himself whether he is right or wrong, without the opinion of his teacher. The students commence with drawing upon black boards, with white chalk. This is for economy's sake. The 1st class draws figures altogether rectilinear. The 2nd class, still drawing on the black boards, draws figures in which curves and right lines are combined, or curvilinear figures, based upon their angular construction, as shown by right lines. The 3rd class studies on paper. I approve of the charcoal upon paper, but it is too costly for the poorer students. The examples sent, with three exceptions, which are dated some days back, are a selection from the result of a two-hours lesson this evening (March 13) in our Elementary School; the original diagram being by one of the elementary masters. The process of construction is shown by the state of one drawing as compared with another, and fully illustrate the *truth* of Herr Kumpa's proposition; as regards its *novelty*, that is another question."

Mr. D. R. Hay, (of Edinburgh) writes, "I have no further remark to make, than that I believe Herr Kumpa's method of teaching drawing a very good one for very young people; but I do not see any principle of a new style of Architecture evolved in it."

Mr. Digby Wyatt said, he thought all who had listened to the paper, must agree that it certainly possessed at least three good qualities, viz., that it was lucid, earnest, and short, and he would endeavour as far as possible, to emulate these merits in the observations he had to offer upon it. So far as the pith and moral of the paper were concerned, the whole might have been summed up into the smallest possible compass, if the author had simply stated that the study of geometry was essential to a successful prosecution of the fine arts; those few words comprehensively expressed all that was really important in Herr Kumpa's system. Of course the steps by which the results shown upon the walls had been obtained, were to a certain extent original, since it was open to any professor, in working to its ultimate consequences any theoretic system, however popular or well-known, to modify the progressive steps according to his own views. He thought a more scientific and equally simple mode of teaching geometry would be, to develope various elementary geometrical figures, so that the student might recognise the properties of each first of all, and then their mutual relation when brought together; rather than to work out single figures to their ultimate complications. By this latter mode the pupil lost time, and after all failed to gain an accurate knowledge of geometrical configuration until a late stage in his career; whereas, if in the beginning of his course he had taken the circle, the square, and the triangle, and mastered their peculiarities and properties, he would have learned to apply them when necessary to verify the leading lines of whatever natural object he might be called upon to imitate. So far as the application of the system of geometry to the teaching of elementary drawing in connection with industrial training was concerned, it was scarcely necessary for Mr. Redgrave or Mr. Wallis to vindicate the universality of its adoption in this country, since almost every drawing-book which had been prepared for the use of pupils, had for many years been based upon a more or less complete symmetrical development. Those who were acquainted with the work of the Baron Dupin, "La Geometrie appliquée aux Arts," published some twenty years ago, and translated by Dr. Birkbeck, would know, that throughout France, and more particularly in the great Conservatoire des Arts et Metiers, the same system had long obtained. Disposing, therefore, in a few words, of the novelty of Herr Kumpa's proposition, he now came to two particular points of analysis, which did not appear to have been sufficiently attended to in the paper. Drawing, it was always to be remembered, was of two natures, one of which only the author had fully taken into account. It was, primarily imitative, and, secondarily, abstract, involving all projection of forms upon planes. He thought the best geometrical system as a beginning was rarely of advantage in leading to ultimately good imitative drawing, because scarcely any curves admitting of easy projection, and much less the forms and lines in the figures now exhibited, were those which ordinarily met the eye in any material objects, modified by perspective, which the pupil might be called upon to imitate. The curves of the human figure, for instance, were compound and ever changing curves of the higher order, and, therefore, the pupil who, in the beginning of his career, had become too much accustomed to straight lines, arcs, and segments of circles, took some time to get rid of a hard and regular mode of drawing, and was unable to define with delicacy and facility the curves either of flowers or of the contours of the human figure. He thought, with regard to *projection*, as contra-distinguished from simple imitation, that the best way to prepare a pupil to derive most ultimate benefit was first to let him try and imitate the form of any object, and find out for himself the diffi-

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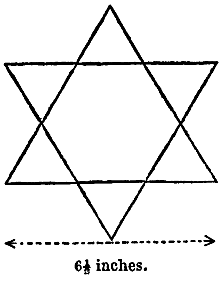
[*] "Stage 22a.—Elementary Design. A set of 4 studies (mounted on one sheet) of modes of filling the accompanying spaces with forms of the leaves and flowers of the wood anemone ornamentally arranged, either treated in a self colour, or in complementary hues or tints."



[†] "The methods by which they are led to exercise the inventive faculty, both in form and colour, according to definite laws of arrangement, quantity, space, &c. The results of this system of instruction seem to warrant the conclusion that laws of arrangement judiciously defined for the student rather increase than limit the sources of variety. The fact that in more than two hundred studies in this class the same geometrical figure has been filled, more or less agreeably, by a varied arrangement of the same simple flower, shows the infinite variety that may be obtained while conforming to certain rules and principles of composition, and that the inventive faculty is stimulated rather than checked by means of such rules." The examiners were Sir C. L. Eastlake, President of the Royal Academy, Mr. D. Maclise, R.A., and Mr. R. Redgrave, R.A.

culty of mastering general proportion, unassisted by a knowledge of certain abstract forms, to serve as gauges and scales to test the truth and aberrations of vision. If geometrical figures, made in wires, were placed immediately in front of the object the pupil might be attempting to project, he would recognise the fact, that unless he had some such lines, either tangible or abstract, in his memory to guide him, he would be liable to remain astray indefinitely. He would thus constantly be made to feel the necessity of geometry, and to appreciate its value; while the acquisition of such experience would probably induce him to make himself master of its principles. He (Mr. Wyatt) would not detain them longer on the subject of drawing, as he saw that there were other gentlemen present who had distinguished themselves as artists and teachers, and who were far better qualified to deal with the subject than he was. With regard to the architectural part of the subject, he would remind the meeting to be upon their guard, since there was great danger in hastily adopting any system of form as new, and recognising it as likely to engender any new and "natural" system of architecture, for in the first place any such adoption or recognition would involve the ignoring of the labours of generations of wise and able men; even supposing, in the second place, that this responsibility could be assumed, and that all that had gone before was ignored, grave difficulties would yet present themselves; since it was to be remembered that the danger of a rigid geometrical basis in art was, that its presence and imperative laws, prevented the student from exercising himself in those minute refinements of form which lend their winning charms to the highest order of grace. In Greek architecture and other styles of eminently subtle beauty, the geometrical figures in use could only have been exercised by artists who united the highest powers of imitative drawing with a refined knowledge of the mathematical principles of pure geometry, not to be attained by any prosecution of the system of straight lines and portions of circles they saw before them. The Romans converted the beautiful ovoid, hyperbola, and parabolic curves of the Greeks, into those most easily struck by an ignorant workman with a compass. As in that case so also in the Gothic, and even in Moorish art, the triumph of elementary geometry showed the already commencing mortification of the vital part of the art. While geometrical tracery, degenerating into lininess, superseded those curves and flowing forms that were found in early English ornamentation, a system of manufacture came in, which gave a death-blow to poetry and inspiration. So it had been in Greek art, and in the best Byzantine styles; so the Alhambra, although possessing great beauties, sank as compared with the earlier works of the Moors at Cairo and Corduba, into an almost monotonous repetition of forms, which, however complicated or harmonious, failed to affect the imagination with aught of human or dramatic interest; and so in all these diagrams of Herr Kumpa's, they set out with a sense of an almost crystalline rigidity, and felt oppressed with the feeling that as they tried one form and it succeeded, a thousand others were inevitable, generated by no more intellectual effect than by turning the compasses over and over again, with varying radii from varying points. Such mechanical operations, which were beaten out of the field by a good eccentric chuck, could scarcely be dignified with the title of a *new* system of architecture, and most certainly not of a *good* one.

Mr. J. D. **Harding** said he was somewhat taken by surprise in being called upon to express an opinion on a subject to which he had paid so little attention. He fancied that all this system—however good it might be for the purposes for which it was intended—had no proper relation to art. It might be a very good system for mechanically working out patterns, but he was afraid it could never come under the designation of a system of art, for he confessed there did not appear to him anything in it which could lead to an appreciation of nature. They saw very few objects in nature of an angular form, and if there were any, they seldom saw them composed of right angles; and, again, as to those curves, in all the examples exhibited they were segments of circles. Now, he believed there was no form in nature that had, as a curve, the segment of a circle; they were all ovoid. When they considered the beautiful and exquisite form of flowers, which were curvilinear, in order to show how different those curves were, if they took a single leaf, and twined it the least in the hand, it assumed curves of so subtle and beautiful a character as to require the most delicate and educated eye to detect the minute differences, that it did not appear to him that a pupil carried through this or any equally mechanical system, could possibly be in a condition—in the first place, to appreciate, and secondly in a condition to draw any of those curves. Therefore, unless we found that this or any other system led in the first place to an appreciation of nature, and in the second place, to the power of delineating her, he did not think it could be appropriately termed a system of art, but rather one of mechanism. Inasmuch as he ventured to submit that it was not a system of art, he did not think it would be proper in him to take up the time of the meeting in making any observations upon the subject. It might, nevertheless, be a very good system for the purposes for which it was intended, but as those purposes were wide away from everything to which he had given his attention, and as it could not in any way be called art, but rather a mechanical operation, he thought the less he took up the time of the meeting in discussing its proper merits the better.

Mr. **John W. Papworth** was not prepared impromptu to address the meeting, and therefore would not touch the topics already handled by such masters as Mr. Wyatt and Mr. Harding; he would rather call attention to one of the preliminary passages of the paper of the evening, in which there occurred, what he considered at first an incautiously expressed idea, but afterwards found repeatedly as a fundamental error in the paper. He alluded to the words "DRAWING, *as an art, beyond its merely mechanical quality, of representing external objects as they appear to the eye, is truly the language of the imagination,*" which, if transferred to another graphic process, would be at once seen to enunciate the absurdity that "WRITING *is the language of the imagination, &c.*" This error was to be combatted, as in the numerous translations from the French and Italian languages now pressed upon the public attention as guides to the knowledge of art, he found the words *drawing* and *design* used with indifference as to their real purport. He would render his meaning clearer by looking at *copying from an example* as mere *drawing*, but at the *invention of a new example* as real *design*. That the manner now explained of teaching drawing as mere *drawing*, if, as appeared, it was to be confined to the use of divided squares and circles, was imperfect—admitted of no discussion. He repudiated the notion that straight lines were the first and chief objects to be gained by the student, for in the educations which he had superintended, a commencement with curved lines had been adopted with greater success than that with straight lines; when the pupil could draw a curved line properly, he could give up the use of a ruler, and a very little practice would give a free-hand line as straight as might be necessary for sketching. Neither would Mr. Papworth do otherwise than equally repudiate the idea that drawing as *design* could be taught by the mode displayed in the diagrams; the variations, though numerous, must be limited in their novelty, still more limited in their applicability, and although useful as only part of a course of education, were desirable when the student had ideas of his own, but pernicious to the pupil who had none. There could be no objection to the use of such diagrams by a draughtsman, either as guides in the construction of presupposed combinations, or as limits provoking the efforts of invention in composition; but the result of drilling in the manner proposed would leave the hand and eye disinclined to the curves which they would subsequently have occasion to form. He therefore held that the three points which the system was supposed to gain, viz., appreciation of angles, power of measurement, and sense of form and beauty, were not attainable in that way, any more than correct views upon polychromatic decoration, a question into which he need not then enter. Mr. Papworth apologised for expressing himself strongly upon these passages, but felt it a duty, as he could speak with some authority, being, perhaps, the only person in England that could say he had taught the deaf and dumb to *design*, *i.e.*, to invent and draw the invention. With regard to the concluding portions of the subject, he could not agree with the view expressed in the paper, that architecture should be more correct in proportions than ornament; he considered all ornament to be a portion of the decorative part of civil architecture. Construction alone was the basis to which he looked for a new system of an architecture that was to be natural, *i.e.*, resultant from its materials, otherwise all symbolized or applied natural and artificial objects, if they were implied by natural architecture, would necessarily be used in a known style or in a mixture of known styles. In conclusion, he would say that he was surprised and alarmed to hear a repetition of the dogma that conventional and natural objects could exist together in a good design for any purpose. It was sufficiently clearly understood and taught, as he hoped, at the present time, that in spite of examples of bad taste from great hands, the artist in decoration must give conventionality in some degree to natural objects, and most of all when he applied them in conjunction with geometric or any other artificial forms.

Mr. **Waterhouse Hawkins** said it would be with great reluctance he should offer any critical observations upon the paper which had just been read, as being evidently the production of a gentleman who was a total stranger to all that had been done in this country during the last fifteen years, and our better use of better means, as had been so well described by Mr. Redgrave and Mr. George Wallis, as well as by the excellent observations of Mr. Digby Wyatt, rendered any remarks from him superfluous. He would merely say, that with his experience in geometrical teaching, the present proposed use of geometrical diagrams as a means of teaching drawing, did not suggest any facilities which could not be obtained by the use of a rule and pair of compasses, and so far from the possibility of a new system of architecture being generated by such mechanical means, its adoption would, according to his belief, be the death-blow to all art in connection with architecture.

Mr. F. S. **Cary** felt that the subject before the meeting was not one which came under that branch of the art to which he had more especially directed his attention. If it were merely a mode to teach people to draw lines, no doubt this was an excellent plan of doing it; and, looking at it as early practice—say for children of ten to twelve years of age, or, as Mr. Wallis had stated, for three months' practice for older pupils, he (Mr. Cary) conceived it might be an excellent plan to draw lines, squares, and the curious combinations shown in the diagrams, but it did not apply to his branch of study, which had been imitations of the human form and forms of nature. The plan which had been represented to him as the right one, and which he had endeavoured to act upon during all his practice, was to show how those things could be represented which really existed, and how to convey, by drawing, to the minds of others an impression of whatever occurred to one's own imagination. He did not think the system now under consideration would apply to the representation of natural objects, and certainly the figures exhibited did not resemble anything he had seen in nature. After the observations which had fallen from Mr. Digby Wyatt and Mr. Harding, he felt that the question had been perfectly "used up."

Mr. **Henry Twining** thought that the disparaging remarks which had been made on Herr Kumpa's system, partly arose from its having been considered with reference to Art in general, whereas he thought that, by confining this discovery within its due limits, and considering its applicability chiefly to patterns in tapestry, paper-hangings, marqueterie, &c., it would be found to possess a considerable degree of utility and interest. He thought, also, that although the use ot geometrical figures for teaching the art of drawing was not a new discovery, there was something original in the manner in which Herr Kumpa facilitated the construction of his various figures by means of cyphers, which, when once understood with reference to the simpler designs or patterns, served as a key to the formation of those which followed in succession. It was desirable that this system should not be confounded with those which tended to make geometry subservient to the highest realisations of art. Systems had been formed which sought to attain perfection and beauty of form by the rules of geometry; as these tended to check the development of taste, and to mislead the judgment, they might be considered dangerous. No such objection, he considered, attached to Herr Kumpa's system, which, keeping aloof from æsthetical theories, appeared to aim at teaching, by a quick and secure means, those forms of objects which had already been recognised as most suitable for ornamental art, and which might, therefore, be introduced with advantage into those schools or classes which were especially appropriated to this branch of the art.

Mr. **Henry Mogford** must prefix his remarks by saying, that there was not the slightest pretension to call the system now propounded by Herr Kumpa, a novelty. The diagrams before the meeting had been published in a great number of elementary works on Linear Drawing, in France and Belgium, and, he believed, also some in Germany. Having himself had an extensive practice in teaching drawing among the youth of both sexes, from those very works, he was free to assert that, in endeavouring to make use of similar mathematical diagrams for his pupils to copy, either on black boards or on slates, they failed of their purpose to create any interest in the pursuit of drawing. When he looked at the diagrams the Professor had exhibited, they appeared to be entirely the production of the rule and compass, and not to have been drawn by free hand without these mechanical aids. It seemed to him an erroneous proceeding to expect youths to draw by free-hand pure mathematical curves when the commonest experience was patent to all, that the simple curves which formed the letters of handwriting were rarely attainable by them as they should be formed. How could we, then, expect that the variety of combinations in the diagrams before the meeting were to be drawn with any regard to exactness. In the instruction proposed to be given by this system, he had merely to observe that, the occupations and isolation of the agricultural population placed them out of consideration, and it was to the manufacturing classes—to our artizans—that the elements of drawing must prove of the highest advantage. A more just and beautiful apothegm was never enunciated, than the one for which we were indebted to Lord Ashburton, "that common people should be taught common things." Now, instead of instructing mechanics, or endeavouring to do so, to draw the complications before the meeting, which could give them no interest, he believed the best instruction that could be given would be to draw accurately their own working tools—their chisels, planes, and the hundred appliances by which they earned their daily bread. This study of the forms of things in their constant use would have the additional utility of improving their judgment in the selection of working tools, and they would insensibly acquire a mathematical knowledge, as it was upon true mathematical principles that good and efficient tools could only be constructed. In addition to this acquirement to artizans, it might, perhaps, be permitted to suggest that the best instruction to make excellent working mechanics, was to enable them to draw, by free-hand also, the identical objects they were engaged in manufacturing. But to place before them combinations of pure curves having no representation to their minds of any actual object they were accustomed to see, would, he was sure, prove a failure, independently of the hopelessness that men who were incompetent to write their names in the true forms of letters, should be ever able to conquer by free-hand pure mathematical curves running in all directions over a surface. On the subject of architecture, he ought to feel hesitation in the presence of the learned Professor who occupied the chair on the present occasion, still he hoped he might be excused a few words on the advent of a new style in this beautiful art. He could not believe that human genius, in its production, was exhausted, but he thought he might venture to say, the foundation of architecture being utility, a new style could only be conceived by uniting utility with the requirements of climate, and with the aid of those new elements for construction which might hereafter arise; perhaps glass might play an important part in such a style. With our advancing learning and civilization it must infallibly be imbued with beauty of form and ornament to be accepted. It had been better expressed than he could hope to do, by Plato, in "De Republica," book 3. He says, "painting, architecture, and the other arts, as well as all public games and spectacles, in short every external object, as far as possible, should appear constantly before us in their full beauty and perfection. Thus living in the perpetual contemplation of the most perfect works of the arts, as in an atmosphere of the highest purity and serenity, we should feel their influence penetrate the inmost recesses of the soul, and by a correlative instinct display in our actions and our manners the same degree of refinement, harmony, and the highest virtues of humanity."

Mr. **Burchett** said he should confine his remarks wholly to the system proposed, as a *new method of teaching drawing*, leaving any consideration of its application to the evolvement of a new style of architecture to others more competent to discuss its merits in that direction. It must be evident that the method proposed by Herr Kumpa referred only to the representations of the outlines of forms, and not to what was usually implied in the term drawing any complete representation of objects by the imitation of their form, and light, and shadow. In fact, that *drawing in outline* was the utmost extent to which the system, as a method of drawing, could be applied. The drawings exhibited must also of course be regarded as *examples* to be *copied* by the student as a preliminary study to his drawing from natural or other real forms. The subject under discussion, therefore, would appear to be, not *whether the method proposed by Herr Kumpa was either a new or a good method of teaching drawing*, but *whether it was a new or a good method of teaching the first step in learning to draw*. The *outlines* or *figures* of objects were expressed by lines, either straight or curved, such lines having given relations to one another. The art of representing, in outline, the appearances of objects would, therefore, consist in the ability to draw lines of every degree of varying character and extent, and placing lines in any required relation to other lines. The placing, therefore, lines of the simplest character before a student for his imitation, and, as a second step, directing him to place such lines in some given relation to other similar lines, as proposed in Fig. 1, appeared to be a first step in a method of procedure likely to achieve the desired result—the repetition of lines of the same character, giving the student an increase of practice, and therefore a greater power of drawing that particular line. The commencement of the practice of proportional subdivision of lines, as shown in Figs. 2, 3, 4, 5, 6, and 7 followed in natural sequence the first steps; the drawing of straight lines, the subdivision of straight lines, and the placing of straight linee in given relation to each other, having been the extent of the practice of this section of the instruction, the second section presenting a similar treatment of simple curved lines. This, therefore, was the essential principle of the system, as applied to teaching drawing, the drawing of lines of a geometric character, the practice of subdividing them, and the placing such lines in given relations to one another; producing, by such combination, figures more or less varied, according to the complexity of the arrangement. This principle—this method of procedure—had been fully recognised, and long acted upon in the teaching of Elementary Drawing. In the Government Drawing Book, produced by Mr. Dyce, thirteen years ago, the whole of the two first numbers was devoted to precisely the same class of examples, and a large collection of similar ones might be found in the Drawing Book published in Germany, by Veitbrecht, which had for the same period been in use in the Schools of Design in this country. The right-line patterns of Moresque ornamentation would supply an almost unlimited number of similar examples. The examples exhibited by Herr Kumpa, as well as those by Mr. Dyce and by Herr Veitbrecht, might be regarded in two views; first, as examples from which to learn to draw, and second, as examples of, and incentives to, geometric design. His (Mr. Burchett's) remarks applied wholly to their use as examples from which to learn to draw. It was evident that any value they might possess in this character must depend upon their being copied by the hand, unaided by any instrument, by their being used as what was technically termed, examples for *free-hand* drawing. The advantages which this class of examples would offer would be, 1st, the simplicity of the individual lines—presenting to the student a subject easily criticised, and, therefore, one which his own powers of perception might insure a fair imitation of; 2nd, simple subdivisions of the line when produced, thus exercising him in proportioning quantities or spaces; and 3rd, the placing lines in given relations to each other, such relations being readily criticisable from the regular character of the figure produced. These were, it was believed, the only particular merits to which this class of figures could lay claim as examples from which to learn to draw. Let us now examine whether there were any probable particular disadvantages likely to attach to the use of examples such as those exhibited. In seeking to make tuition in drawing a part of general education, it would be evident that this object must be, to a great extent, limited, to giving to all a power of more or less accurately expressing their ideas in a language more ready and intelligible than writing, and we might fairly suppose that the subjects and objects on which such language of form would be employed, would consist generally of such things as were related to our every-day wants and associations. In fact, that such drawing would be of an *imitative* rather than an *inventive* character— but further than this, *imitation* must claim the first effort of the student who proposed even higher aims to himself; whether he be the designer of ornament or the producer of pictures, in both cases must the imitation of nature and the knowledge and power acquired thereby precede the practice of design. Again, it would generally be found that the nascent art element was indicated by the love of imitation; and upon what subject was this power of imitation, either possessed or to be acquired, likely to be exercised? It would be upon the objects which surrounded or were familar to the student, the workmen, or the amateur—things which had known existence, uses, and associations, the successful imitation of which would be both an end and a stimulant to further practice. But the figures exhibited by Herr Kumpa were abstract figures, combinations of geometric forms, possessing but a remote connection with natural form or with the products of formative art, and for this reason, and in this respect, were they undesirable examples from which to learn to draw. The objection, then, was made not to the principle enunciated, but to the examples employed. During the past three years, considerable efforts had been made by the Department of Science and Art, to introduce drawing into general education; in furtherance of this object, tuition in drawing had been given in a large number of parochial schools in London and in the provinces. In many of these schools large classes, varying from eighty to one hundred and twenty, had been taught drawing at one time—the method adopted being that the master drew on the black board a figure, *geometric in its character*—explaining as he proceeded the character of the line employed, the relation of the second line to the first, and so on, and the nature of any subdivisions he might employ—the children copying, step by step, the work of the master, drawing generally on their slates, sometimes on small black canvasses, with white chalk, and the more advanced on paper, in pencil. This system, which had been in full operation in London for the last three years, had offered many opportunities for testing the advantage derivable from the use of examples suggested by objects with which the students were familiar, and a representation of which by themselves, however imperfect, gave great additional pleasure to any derivable from an imitation of abstract geometric forms;—thus, instead of the square, as in Fig. 1, an oblong, the pairs of sides having a given proportion to each other, has been proposed; parallels at a given distance within the first lines had been drawn, a second series of parallels within the first, with the mitre lines at the angles, the pins at the corners, the strap for the pencil, the pencil itself, more parallels having a given proportion to the length of the side, the holes for the string, and, lastly, the string itself; the result being an exercise quite as full of practice as Fig. 1, and having, besides, the feature of individuality, the charm of imitation—to the student no small one; and tending, also, to stimulate the faculties of *observation* and *perception*, faculties, of all others, first requiring development in art education, of however humble a character. Many other instances had fallen under his notice, of which one might be mentioned. On visiting a parochial school, the master was found with a square drawn on the black board, its two diagonals and a semicircle described on the upper side. The students were evidently copying this languidly, and one, on being spoken to, said, "They did not know what it meant." A fresh lesson was commenced—an upright oblong was drawn, an equilateral arch constructed on the top, lines drawn parallel to the sides, some horizontal lines, and some diagonals, all having given positions and proportions obtained by proposed subdivisions. Great interest was soon manifested by the students, and on being asked, if they knew what "that meant?" one simultaneous shout proclaimed it was the "school-door"—as a mark of honour the best draughtsmen were allowed to add the fittings of the door. All education in drawing must have for its object the enabling the student to represent the *appearances of things.* The extent to which this power might be sought to be imparted must undoubtedly be a question of degree, but the character of the instruction would differ but in degree, not in kind. He did not think a method of teaching drawing in a parish school could be a good method, if it was not also a good method, so far as it went, for teaching drawing to a nascent academician; and in all schools an all-important consideration must ever be borne in mind, that all copying from the flat (or from examples) was but the preparatory step to drawing from nature, and any system which did not constantly bear this in mind was a bad system, and one that mistook the means for the end. All drawing from the flat should only be employed as a means of educating the eye to perceive, and the hand to imitate forms, which being *represented by lines,* presented at first fewer difficulties to the student in *copying* them than the *imitation* of the forms themselves would do. And here it might be questioned whether any long continuance at the practice of straight lines and the common curves would not be apt to *blunt,* at least to some extent, rather than to educate the eye to perceive the delicate inflections of line that was found throughout the works of nature and of beautiful art. Some years ago a set of models of the head and extremities were introduced to public notice, invented by Mr. Dupuis. The human form was in this case sought to be reduced to forms which might be represented by a series of shorter or longer straight lines; a very competent tribunal in this country condemned them, and that condemnation had been repeated in the past year by a tribunal, no doubt equally competent, in Paris. It was felt in both cases that a hard unfeeling and mechanical manner of drawing would result from such a course of study. It was not necessary that he should pursue the subject further, having regarded it only as a method of teaching drawing; that its principle was better than the examples which illustrated it would, he believed, be found in practice; that it was anything but *new* was only another proof, among a multitude, that different minds, widely separated, arrived at similar results, and adopted similar practices at the same time, unconscious of the existence of each other until accident brought their expressed opinions into contact.

Mr. **Digby Wyatt** begged to say one word as to the general result of what had been observed by the late speakers. He thought it was but just to Herr Kumpa to remark that, although the meeting appeared to invalidate his claim to novelty, they did not wish to do so with regard to originality in the working out of his system; for this reason—that any person who attempted to go through a series of elementary forms was very likely to—indeed he must—hit upon a certain number of the same forms that others occupied in analogous studies must have already done. Therefore, although it appeared to be the case, that in most of the various drawing-books which took notice of geometry, many of Herr Kumpa's diagrams occurred; it must be felt, from the elaborate designs, to which the progressive elaboration of the figures shown in his diagrams had given rise, that Herr Kumpa and his assistants had worked out a system, which they would appear to have conscientiously believed to be both novel and original. How impossible it was to express the deep inspiration upon which they had been told the design for the Palace of Justice had been based by such self-generated forms alone, would, he thought, be apparent upon the most cursory inspection of the beautifully-executed drawings upon the walls. He (Mr. Wyatt) thought speakers had not sufficiently regarded the complete difference between drawing as an imitation, and drawing as a projection. The one was mainly perfected by the visual and manual faculties—the other specially affected the reason and imagination, and a thing was pourtrayed the tangible existence of which was not involved. Such was the great difference between the two systems. Architecture, and indeed all high art, was always a compound of the two; invoking the aid of both geometry and imitation if they would "please the eye, or win the heart." He considered that the fault of those designs lay in the fact, that compounds of elementary geometrical forms, of a low order of structure, occupied the most prominent parts, whereas they should only have diapered the more retiring surfaces. Those, he thought, were the main points which appeared to call for a word or two from him. One remark he would offer as to Mr. Papworth's comments on conventionalising form. He (Mr. Wyatt) observed a tendency on the part of all self-convicted of error, to jump very quickly, and often too violently, to contrary conclusions. A few years ago producers arrived at too great a tendency to direct imitation. Few objects of manufacture were supposed to be good unless they had some story to tell; unless they represented men, birds, beasts, or fishes, or flowers and plants thriving as in wild Nature. But that was afterwards felt to be wrong; they then ran away with the idea that nothing was right unless it was conventionalised with a pretty complete abjuration of natural forms. Either excess, he felt, involved error, since those designs had always retained most permanent popularity in which simplicity, and conventional or geometrical combinations were made the back-ground, from which were relieved the more interesting features, those involving an approach to direct imitation; by contrast with convention, that which was human, and spoke directly to the understanding and imagination, had invariably additional brilliancy imparted to it.

Captain L. L. **Boscawen Ibbetson** thought the discussion had taken more the turn of high art and architecture than he supposed Herr Kumpa intended. During the progress of his (Capt. Ibbetson's) mission last year, at the request of the Society of Arts, through the principal towns of Germany, his attention was drawn by Herr Bouffier to Herr Kumpa's work, and he particularly requested that it should be sent to the Society of Arts for the Educational Exhibition, as any novelty in the teaching of so important a branch of study as drawing, must lead to some good result. His attention at that time was especially called to elementary schools, and in all the towns he visited where (Gewerbe) or Industrial Schools were most flourishing, he found the drawing schools the most frequented, and even in some of the towns. The first principles of drawing were taught in the Kripe, or Infant Schools, not merely for taste and art, but to accustom the infant mind to certain geometric forms, so essential to mechanics, as the mind's eye of a mechanic for drawing, and the mind's eye of an artist, were essentially different. There were certain applications of Herr Kumpa's method which were new, but as to the first general principle, he was taught that himself at the Military College, many years ago. He was sorry to see that the diagrams had the appearance of being drawn by the rule and compass, when he was certain, from a conversation he had had with Herr Kumpa, that the *elementary* part of his method was intended to be entirely free-hand drawing, and for the purpose of giving geometric ideas to the youthful mind, as he had before mentioned. Although Herr Kumpa might have made a mistake as to the novelty of the entire invention, still the Society must feel obliged to him for the labour he had bestowed upon his work, and the ingenuity he had displayed. He must also add that Herr Scholz deserved great credit for his universal zeal in publishing everything he thought might be advantageous to the advancement of knowledge.

Mr. **Harding** remarked, that whilst they were always glad to receive new ideas from any quarter, yet they ought not to overlook what had been done in this matter by one of their own countrymen, Mr. D. R. Hay, of Edinburgh, who had produced some very beautiful and elaborate patterns by a system of geometrical figures, somewhat similar in character to those now exhibited; and in one of that gentleman's works he had entered into a system of curved lines—*not segments of circles*—but treated of the æsthetic beauty of ovoid curves. Mr. Hay had put forth his works in a very elaborate form, and having looked into them, he thought they evinced as great, if not greater talent, of the same kind, as was laid claim to in the system of patterns now exhibited. It appeared to him that the application of Mr. Hay's system was capable of producing endless varieties of forms for paper-hangings, floor-cloths, carpets, and tapestry of any kind.

Mr. **Warren** wished to put in a word for a class of learners in drawing to whom this system of teaching was not applicable, but of whom no notice had been taken in the discussion. The observations of the different speakers referred to the instruction of children whose future pursuits were yet to be decided on, and whose minds had yet to be formed, or to those who studied as artists or for the purpose of design. He wished to say a word for the working men, having been connected with the introduction in this country of drawing schools intended specially for that class. Some instruction in geometrical drawing was necessary for carpenters and masons, to enable them to set out the work they had to execute; but he had found geometrical classes never well attended —there was too much necessary formality in the instruction to interest the minds of the men. In what were called the art classes of these schools, however, he found great interest taken by the men; the object of these studies was to teach them the true natural forms of the objects of ornamentation which they had to execute in wood, stone, ivory, plaster, silver, gold, or iron—and for this object free-hand drawing alone was suitable. On the proper instruction of these artisans much depended for the diffusion of a real appreciation of art in every-day life, and he could have wished that in the discussion more consideration had been paid to the teaching of these, the hard-handed men.

The **Chairman** said that he felt he should only express the general feeling of the meeting in proposing a vote of thanks to Herr Kumpa, for the important paper which had been read, and which had given rise to so many useful and instructive remarks from various gentlemen of high attainments and of great experience in the subject; and who had so fully treated the matters relating to it, that he should not detain the meeting long by the few observations which he had to offer. He thought that Herr Kumpa's aim had hardly been distinctly appreciated, and that he had been supposed to give greater extension to his system than he himself intended; a natural mistake, however, arising from the title of the paper. Herr Kumpa stated that "he intended to guide the mind to the appreciation of form in nature by geometric figures." No one could doubt the utility of this; for, in looking at Barry's fine pictures on the walls around, it must be obvious that the natural uninstructed mind would be bewildered in the variety of graceful forms, unless it brought to its aid some artificial means of reducing the general masses into something like geometric figures in the first instance; and thus the mind and hand also would get into the habit of a certain training, which should control their operations. Allusion had been made to the first element of a straight line, which it was necessary to have the power to express. But the truth was, that, as Nature abhorred a vacuum, so she likewise abhorred a straight line, for it was never found in Nature.

Mr. **Tennant** apologised for interrupting the chairman, but crystals afforded an exception to the remark he had just made. It was probably in the recollection of some architects present, that the late Mr. Inwood commenced a work, about twenty years since, in which he endeavoured to show that architectural illustrations might be taken from crystallized minerals.

The **Chairman** remarked, that this was an exceptional case, and, as it were, produced by an artificial means, if it might so be said, of Nature herself. But no artist would recognise that crystals could come, as to artistic treatment, under the class of natural objects. In the architecture of the Greeks there was no straight line; their cornices were all curved, as had been proved by Mr. Penrose. The earlier specimens of Greek sculpture, as in the Temple of Ægina, were highly geometric, the limbs strictly angular; but Phidias, and the subsequent sculptors of the Greek school, threw aside those restraints, and followed the graceful flowing lines of Nature. Herr Kumpa only offered his system to produce a mental training—but what class of training? His own words were, "for those engaged in manufactures and the arts." Thus he judiciously limited its application. And, be it observed, as to manufactures, a subordinate department of architecture owed all its excellence to mere geometric forms. As Mosaics, and all classes of inlaying—viz., parqueterie, marqueterie, the ingenious inlaid works of India, China, and the American Indians, showing that this system was the first natural step of the lowest class of minds to produce effect by simple elements of form. Thus geometry, applied in this manner, produced precision and symmetry, but not proportion; for the pupil was restricted to the elementary diagrams, and thus the system could not properly pretend to reach the higher intellectual powers of invention and creation. We might assume, then, that it was a mistake to suppose that this system could produce a new style of architecture. That depended upon a more important primary element. One speaker had alluded to glass as calculated to suggest a new style. Iron, also, was likely to effect taste and proportion in a great degree; and it might be observed, that all the styles of antiquity, and even of recent times, depended either upon the materials used or a new system of construction introduced, as with the mediæval architects, Indians, and Chinese. We must agree, then, with Herr Kumpa, that geometric forms were desirable, as an elementary principle, to enable the beginner to appreciate form, and to give a species not only of mental training, but also of mechanical handling—a system known, however, long ago, and extensively used already in foreign countries, and in this one, with much success. But it seemed difficult to agree with the author of the paper, that it could mount any higher, or furnish those exquisite results or nobler productions of the imagination, so as to create a new style of architecture, or a new school of high art. In conclusion, the chairman proposed a vote of thanks to Herr Kumpa, which was unanimously responded to.

Dr. Thudicum would not address the meeting at any length, seeing that the time allotted for discussion had passed. He merely wished to be permitted to offer a few remarks in reply, on behalf of Herr Kumpa; and first he begged to make, what he might be allowed to call, a statement in behalf of Herr Kumpa. This gentleman was publishing his work when Captain Ibbetson, an emissary of this Society, invited Herr Scholz, of Mayence, the well-known publisher, to send Herr Kumpa's work, though not finished, to the then Educational Exhibition of this Society. Captain Ibbetson's invitation eventually amounted to an encouragement for Herr Kumpa to be himself the bearer of his work That gentleman arrived in England a few days before the close of the exhibition. Notwithstanding, Herr Kumpa resolved upon submitting his system to the consideration of the Society. In spite of many extraneous difficulties, he ultimately was enabled to lay his views before this meeting, in the paper which had been read. After having stated this, he could not do more than convey to this meeting the most sincere thanks of Herr Kumpa for the kind attention given to his paper, and particularly to express Herr Kumpa's gratitude for the many valuable remarks and suggestions offered by the different gentlemen during the discussion. Herr Kumpa would certainly give his deepest consideration to all the opinions that had been expressed, which on the whole, he might say, seemed to admit the system as such, the method as a whole, to be new; the novelty of the single steps Herr Kumpa would never venture to claim, as the combination of lines to a system, to a figure had been known to all ages since *Pythagoras*. But the gradual development of one from the other, by an addition of lines or curves, and the thorough systematic arrangement, would, perhaps, on closer examination, be found novel. If it would not be presumptuous on his part, he might be allowed to say, that it was his impression that the architectural part had attracted more attention than the system of teaching drawing. Now Herr Kumpa wished it to be particularly understood, that he intended to teach able mechanics, masons, carpenters, designers, and so on; in short, practical men rather than artists. A technical school could never be expected to form artists. Therefore his system was particularly directed to assist the many unaided by genius, because genius wanted little assistance. But in practical life, which was not generally the arena of genius, we wanted the concise aid of mathematical figures to teach the many how to convey and express their ideas and conceptions. For this purpose Herr Kumpa's system would be found particularly applicable. Some speakers had remarked, that in their practical experience, gained in teaching after some parts of Herr Kumpa's plan, the pupils got tired. In reply to that he begged to state, that Herr Kumpa, in an experience of eight years, gained in his quality as teacher at the Polytechnic School at Darmstadt, in private schools at Darmstadt and at Dresden, the reverse of what the speakers stated as their experience had been the fact. The pupils of both sexes, and all ages, a great many in number, had invariably been interested, so much so as to induce them to proceed to construct on their own account the complicated figures according to Herr Kumpa's plan before they had ever seen the originals. The pupils progressed rapidly, and became good designers. He regretted that he was unable to reply to all the varied remarks which the different speakers had favoured the meeting with, as his pursuits were quite apart from art. And, still more, he regretted that Herr Kumpa himself was unable to reply at full length, as he had no doubt but that that gentleman would have been able to settle many doubtful points at once, and to explain fully what could be explained only partially and imperfectly. Perhaps the future might enable him to do so.

Dr. Hoffman said it would be altogether presumptuous on his part, in the presence of so many masters in the art of drawing, to offer any remarks on the relation in which Herr Kumpa's method of teaching stood to the higher walks of art, nor could he pretend to have an opinion how far this method would be successful in assisting the student in its humbler branches; but he begged leave to say a few words regarding a special application of Herr Kumpa's plan, which appeared to him to deserve the notice of the Society. He was speaking of the representation of *crystals*. It had been repeatedly stated during the discussion, that straight lines did not occur in nature. But he thought it would be admitted that an exception must be made in favour of the straight line if you contemplated the beautiful form which chemical compounds assumed in their passing from the liquid to the solid state, not by any artificial interference on the part of the chemist, but in virtue of the peculiar powers which belonged to the smallest particles of matter. He could not, perhaps, offer a better illustration of these forms, than by calling attention to a kind of crystals, which of late had been brought rather extensively under notice. By examining a diagram representing snow flakes, upon a colossal scale, which he had brought for the occasion, it would be found that here we constantly met not only with straight lines, but also with forms very similar, and in many cases identical, with those figures into which Herr Kumpa had combined the straight lines in the development of his system. He might mention that he had carefully examined Herr Kumpa's plan, and that he believed it admirably adapted for assisting the students in drawings of the kind to which he had alluded, and he had no doubt that all engaged in similar pursuits would find that gentleman's elaboration of the subject would render them very considerable assistance.

The Secretary announced that there would be a *Special* Meeting on the Evening of Monday next, the 19th inst., for the purpose of resuming the discussion on "The Sewage of London." Also, that there would be No Meeting on the Evening of Wednesday, the 21st inst.

PROPOSED EXCURSION OF THE MEMBERS OF THE SOCIETY OF ARTS TO PARIS DURING THE EXHIBITION.

It is proposed that the members of the Society should join in an excursion to Paris during the summer, to visit the Exhibition. It has been suggested that, probably on such an occasion, special facilities for visiting various interesting objects might be obtained for the members of the Society, and that convenient hotel and lodging arrangements may be secured if sufficient time beforehand be given. Members desirous of joining in the excursion are requested to send in their names to the Secretary as early as possible. As soon as a sufficient number of names are received a meeting will be called to fix the time of the visit and determine the general arrangements for it.

Home Correspondence.

ON THE CONSTRUCTION OF SHIPS OF WAR.

Sir,—The national importance of the subject prompted the drawing up of the following paper of suggestions for improving the efficiency of our ships of war, in January last, not indeed with any assurance that the Admiralty could be moved by an individual effort to so progressive a step, but under the impression that it behoves every subject of the state to do what in him lies to strengthen her efforts at the present crisis, whatever may be his opinion as to the original expediency of the struggle she is engaged in.

Though more than one engineer of the first ability has expressed a very favourable opinion of certain of these suggestions, your correspondent is quite prepared for various grave objections being raised against them. To such all efforts after important ends must be obnoxious in this our sublunary state, where every action of our lives is but a choice of evils. Any plan promising great advantage, free of all disadvantages, can find no practical realisation in this our lower world.

Thus the stem of a floating battery formed as in Fig. 3 would doubtless diminish its speed; but then, speed is of small moment for it in comparison with security against the possibility of the vessel's grounding. Again, it may be questioned if the stem could be given sufficient strength to act as a kind of plough-share over so large an area of sand, even though the vessel should be proceeding cautiously; but your correspondent has, in long voyages up and down the river Ganges, so repeatedly watched the different effects of shoaling against sands on large boats of various forms of stem, that he is persuaded a heavy flat-bottom vessel could, by a proper construction and strutting of the stem, be better prepared to receive the shock of a cautious speed end on, than the strain of rubbing over gravel and riding up an incline till she was half out of water. But, whatever the strain it involved, the object sought by the former construction—a security against the possibility of lying helplessly grounded in shoal water under the fire of a battery—is one of too great importance to be relinquished until the difficulties, which an unaccustomed form may suggest, have been demonstrated insuperable, either upon constructive principle or by actual trial.

Nor is a security against getting aground the only advantage of such a construction. A vessel so formed could work its way, by repeated impulses, from one deep channel to another, through bars at the mouths of rivers and through shoals between channels, even where there was not over the bar or shoal a depth of water equal to, perhaps, half the vessel's draught. In Asiatic rivers, a fleet of boats, some of them carrying from fifty to one hundred tons of produce, and drawing four feet of water, will be worked through a long and firm sand, over which there are not two feet of water, by mere manual labour; each vessel in turn receiving the aid of two or three crews besides its own, who stand around it in the water, and simultaneously jerk the vessel forwards, so as to agitate the sand into a semi-fluid state.

The question, however, of paramount importance is the protection of ships-of-war from conflagration; and it is the chief object of this paper.

The structure (Fig. I.) proposed as the fabric for future vessels would obviously possess this advantage of incombustibility in an especial degree, together with that of great mechanical strength, and of rendering the timber of old ships, if sound, and also merely cubical blocks of wood, almost equally servicable for new vessels with the primest timber.

It is in no warlike spirit that these proposals have been tendered, but, under the conviction that, so long as a spirit of ambition, vain glory, and aggression, shall continue implanted in man's nature, it is necessary that this country (while more earnest than hitherto in suppressing these evil emotions in herself) should possess a defensive navy of commanding strength; and it is not in a dogmatic spirit, but a suggestive and deferential one, that this paper is submitted to the attention of the Members of the Society of Arts, through its ably-conducted Journal, with the view of inviting to the questions proposed the inventive and constructive talent which abounds amongst them, and which, if duly encouraged by those who have assumed charge of the public interests, would, doubtless, be successfully exerted for the nation's good.

I am, sir,
Your obedient servant,
JULIUS JEFFREYS.

Kingston-hill, Surrey, Feb. 28, 1855.

REMARKS ON SHIPS OF WAR AND FLOATING BATTERIES.

By Julius Jeffreys, F.R.S., F.G.S.

In these days of incandescent projectiles, combustible ships of war promise to become about as serviceable as would be combustible fire-places.

Not only do red-hot shot imperil the wooden walls of England, but it would be easy to suggest a more dangerous missile of conflagration still, the action from which, probably, nothing could save ships, as at present built, from suffering destruction.

Were all the air spaces in ships' walls as necessary as is commonly imagined for retarding decay, they are, in these days of projectile heat, so imminently dangerous as feeders of combustion, that it is a question whether every ship in the navy ought not to be immediately uncased sufficiently for all these interstices to be filled up thoroughly with cement. But this cementing would also put an end to that infiltration of air and moisture which is the real cause of rotting, and which is now rudely remedied by a rush of air. If air were really needful to prevent rotting, the heart of every thick timber to which air has no access would be the first part, instead of the last, to rot. On every account, then, air should be shut out from every part of the *fabric* of a ship.

Having filled up all interstices, the next point is to allow no wooden surfaces to be exposed, but to coat them everywhere with sheet-metal, say copper on the outside and iron* on the inside of the walls, and decks,† and iron around beams, &c. Quite thin metal would answer, if studded over with nails.

A shot, however intensely heated, penetrating and even lodging itself in wood properly coated from the access of air, could only reduce two or three inches of wood around it into charcoal, which, without air, would form a bed indestructible by any heat known, in which the shot might be permitted to lie for any length of time. As to the hole made by the shot, combustion could no more thrive at the bottom of it than in the socket of a deep candlestick in which a light had burnt down; and the hole could always be stopped for the time with clay or cement. The oxygen in the woody fibre itself only suffices to blow off in union with its hydrogen as steam, or with a little carbon also, as some binary, or ternary, pyroligneous compounds. The carbonaceous mass of the wood would assuredly remain unconsumed, so long as air had no free access to it. There is, perhaps, nothing to prevent ships on service from being subjected to this cementing and sheathing process by the carpenters and engineers on board, whenever the weather is fine; planks at different levels being removed, and liquid concreting cement being poured into all crevices to fill them up; the surfaces might then be well cased with metal from the water's edge, as well as all interior surfaces.

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* Or iron on the outside of the ship above water would answer if well painted over, though no galvanic action between the two metals is to be feared through the massive and dry walls.

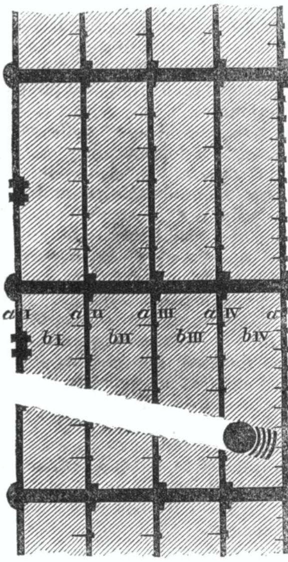
† Over the metal casing of decks thin planks of hard wood might be nailed down, to keep the feet of the crew from the slippery and conducting metal. This planking, on taking fire, could burn but feebly over metal, and could communicate no combustion through it.

The writer is next led to repeat a proposal for the construction of ships' walls in future, which he made last year to an able officer connected with the Admiralty.

For the main substance of ships' walls woody fibre is, perhaps, the best material. But mechanical and economical principles indicate that it should be employed in the walls, not actively as their framework, but what may be termed passively, rather; as a massive support to the material of active strength, and as a tough bed for cushioning shot—destroying gradually that momentum which cannot be instantaneously annihilated.

The great cohesive power of iron points it out as the material for the active strength of the walls. But in *ships*, at least, to give it a shot-proof thickness, cannot be thought of. Let an outer table, or wall of iron, *a* 1., Fig. I., say half an inch thick, of sheets rivetted together as in iron ships, form the exterior surface.

Fig. 1.



Let a foot of wood filling-in *b* 1 (formed of any tough old timber or cubical blocks of wood, with cement to fill up all spaces) come next; then a table, *a* II., of sheets of $\frac{1}{4}$ or $\frac{1}{3}$ inch iron be nailed, with long spiked nails, against this wood filling-in; the edges of the sheets being nailed over each other. Let a second foot, *b* II., of such woodwork follow, and a third table of iron, *a* III., be nailed on to it, and so on, until the wall had the determined thickness, from one foot upwards to any extent required.

Then let bolts of $1\frac{1}{4}$ to 2 inch round iron, pass through the whole, keying up each table of iron, and binding the whole together by screw nuts; there might be one such bolt to every square yard of surface.

Not only would such a fabric for ships' walls possess prodigious strength, probably surpassing, *for them*, the tubular principle of bridges, inasmuch as it would be solidly firm in *every* direction against the countless strains in floating vessels; so that, with proper decking of a like kind, and truss-framing, vessels of gigantic dimensions might be made, if desired; but it would remove all danger of conflagration. It would, likewise, receive solid shot in the very best way. The sheet-iron tables, if duly proportioned in thickness to the wood supporting them, would be punched into the wood behind them, as into a die, as at *g g*, the shot driving on the cup-like pieces before it, until its momentum was exhausted, which cups would, indeed, guard the wood before the shot from singeing, though this is of minor importance.

Such a fabric might be riddled by shot, like a cullender. before its strength was materially impaired, and it could be readily repaired by driving plugs into the shot-holes, and plating over the outermost table of iron and the innermost also, where the shot went clear through the wall.

It is, perhaps, not too much to say that a large ship thus constructed would not be more costly per ton measurement than ordinary ships of war While armed with suitable missiles of conflagration it might set a whole navy of ordinary ships at defiance, and any that approached it destructively on fire in a few minutes.

A floating battery fabricated in the same way, but more massively still, and of the form described below, might, if armed with a missile of another character, be enabled to hew down stone fortresses impregnable by round shot.

The writer has regretted that the experimental iron ships were so hastily denounced. They only required to be banked up with wood against the metal, and this again lined with thinner iron, studded to it with nails, to make them, perhaps, the most serviceable vessels at present afloat. The wood would have served as a die, causing the outer plating of iron to be punched into it by round shot, instead of being extensively crushed in and torn.

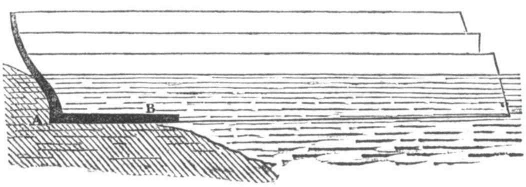
The time has surely come when future ships of war must be constructed in a totally different manner from the present, and when existing ships must have every air passage in their walls—every feeder of conflagration—stuffed with cement, and every wooden surface cut off from the play of oxygen by plating with metal.

A Word on Floating Batteries.

Four or five inch plates of solid iron overlying wood are reported to stop dead the largest round shot, which, after causing considerable indentation, *fly to pieces* against them. Would it not be prudent to try the effect of *wrought* iron shot (easily made by compression), the momentum of which cannot be thus instantaneously destroyed by diffraction, before trusting implicitly to even five such plates? If the plates are still sufficiently resistant, their object will be secured for floating batteries; but for ships of war generally they would, of course, be inapplicable, and, as said to be employed, they do not form the strength of the fabric of batteries, nor guard them from instant conflagration by missiles projected through their port-holes, and conveying fire to exposed surfaces.

As to the form of a floating battery.—It is desirable that it should be so constructed as not only to draw as little water as practicable, but also, if possible, to suffer no injury on running aground upon any surface but solid rock, and to have a tendency to float off by itself, or easily by the aid of its engines. A stem formed like Fig. 3, with a stout recurved foot at A, of massive iron, and with a perfectly flat bottom, would not, on striking, ride up on to a sand or shingle bank, but would plough for the vessel a level bed,

Fig. 3.



over which she would float if trimmed slightly down by the head, while the earth heaped up ahead would help to push her off as soon as her momentum ceased, or, if desired, she might, by returning with repeated moderate impulses, cut her way through a bank of sand to a deeper channel.

By such a construction the whole force of the blow would be thrown lengthways against the bottom, which, if massive and properly framed to the stem, and embraced by iron arms, projecting laterally from the iron foot ahead, should not suffer from the shock of any cautious motion against it, end on; whereas a strain to a vessel riding up on a bank might be much greater, while it would be scarcely possible to get a vessel of immense weight off again when under fire.

In operations against land batteries, the effectiveness of a floating battery would be greatly increased by a freedom from all danger in shoal water, enabling it to operate fearlessly in any position.

The writer ventures to suggest the outline Fig. 2, as the transverse section for a floating battery, and Fig. 4

Fig. 2.

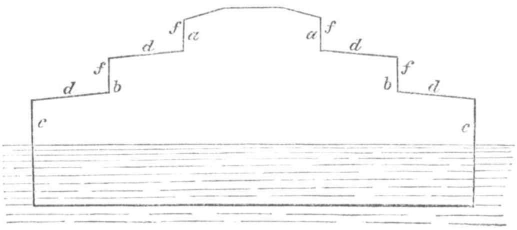
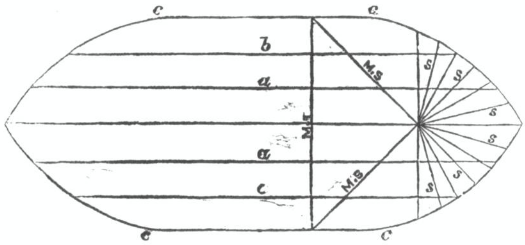


Fig. 4.



as the horizontal plan of different levels. The two upper tiers of guns ranged at *a*, *a*, *b*, *b*, would serve to give the vessel stability without ballast. While the lower tier, *c*, *c*, must, from the great breadth of the vessel, run in an arch round the sides, the two upper might form long straight batteries of guns having the same direction. Also, on the deck spaces *d*, *d*, *d*, *d*, and against the walls, *f*, *f*, might be laid bags of wet sand if desired, which would materially retard the progress of shot. The lines *s*, *s*, *s*, *s*, &c., Fig. 4 suggest converging struts supporting the head of the vessel at the foot and at other levels, and conveying the strain to main struts in the direction of the lines M.S. The whole ongitudinal frame work of the bottom and of the decks ought to support the head pressure at their levels.

Kingston Hill, January, 1855.

STATISTICS OF THE IRON MANUFACTURE.

Sir,—The paper read by Mr. Scrivenor before your Society, on the 13th of December last, gives a very clear and elaborate view of iron manufacture, its progress, its improvement, and its general features to the present time. The tables annexed also exhibit most clearly the fiscal arrangements of other nations, with the direction they are taking, so that the ironmaster, iron merchant, and consumer can readily see and appreciate the whole information brought before them, even in so brief a space, and benefit thereby, although they may be apt to forget the zeal and industry which has drawn together so much worthy their notice.

In two subsequent letters Mr. Scrivenor has announced that he had offered his services as a *general secretary* to the trade, for extending and keeping up all the statistics attendant upon this most important branch of industry and wealth.

If I might be permitted to express an opinion, I would say that such is most worthy of consideration. So important is the trade, sprung up, as it were, into real vitality and importance in the present century, that it appears to me a duty of the Government to assist and to promote it; not in the way of an obnoxious inspection, or as an excise, but with, and having the assistance of, committees of the masters in the several districts for ironmaking in England, Wales, and Scotland, so that a true and accurate return might be made of the whole home supplies, their distribution, and their application, with all matters affecting foreign agencies connected with this valuable mineral, whether fiscal or commercial, when every man directly interested could be able to see the elements at work to promote or retard his operations, while the Government would be provided with such matter as could be safely relied upon, so as to know exactly the riches accruing from this source of national industry.

Surely it is not needful to prove that these objects are worthy of the small expense which would attach for obtaining them? An intelligent, energetic and exact person engaged in such a work, knowing what is required, and acting under those in the trade, could well supply, arrange, and complete such statements as would be needed, and the whole cost, compared with much that is called for by the House of Commons, would really be trifling, yet a great desideratum would be attained, not upon an uncertain or unreliable basis, but upon facts and authority, which is the only way to make returns valuable at any time. Strictly confined to the one object, it should be no part of the duty of such inspector or secretary to introduce matter which would interfere with individual interests, nor yet to attempt to teach the trade any lessons, but giving only statistical facts of all relating to the manufacture at home, and those bearing directly upon it abroad. I know no information which could be made more valuable than this, whether to the government, the ironmaster, or the consumer; indeed, to the people at large, as it refers to an article which affects every comfort and convenience in daily life. My impression is, that it is of such importance as not to be taken up as a mere present inquiry, but to be made a positive and permanent duty, year by year, to be made up to the latest period, and yearly a report to issue, setting forth the position of the interests concerned.

If it should be carried out in the way I have ventured to suggest, and the appointment made and controlled by the committee I have proposed, I do not think it would be difficult to get a large contribution for the purpose from the trade, while Government might be induced to contribute the printing of the reports, and the proceedings of the committee might be well and properly placed under the sanction and confirmation of the President of the Board of Trade.

I have no personal acquaintance with Mr. Scrivenor, only knowing him from his work and the paper he read before your Society; judging from these, I believe him to be a man of sound discretion, and such a person as would be the proper party to enter upon such duties; but as the appointment should rest with the trade, they would decide, and, I doubt not, give him every opportunity for preferring his claims, and his suggestions and labours would have full weight in their minds if the plan be matured and the task fully decided upon.

Since no parties are better acquainted with the necessity of *good and well-proportioned* machinery than those employing it in making iron in all its forms, so no class of men is more likely to appreciate any moral or social machinery, which shall add to their exact knowledge of all that relates to the substance of those products; and from this I would make the deduction, that the ironmasters will see at once how far and how surely that which is proposed will really contribute to their benefit.

The Government cannot but be sensible of the advantages proposed, rather than be groping in the dark, as they must to a great extent do at present, while the consumer will be benefited, even against his will, to an extent he may not examine and therefore cannot estimate.

Sincerely trusting that these remarks may produce good fruit,

I remain, yours, &c.,
THOMAS M. GLADSTONE.

Adelphi Chambers, March 6, 1855.

THE DECIMALISATION OF OUR CURRENCY AND ACCOUNTS.

SIR,—A lady once asked a clergyman, who had laborious duties to perform, "why he did not compose shorter sermons?" The reply was, "That he had not time."

The same excuse may be pleaded by a few writers for not having applied the pruning knife to their prolix and desultory arguments on the decimalisation of our currency. That which is practicable, brief, and simple, and realises our object with the least interference with existing coins and customs, rely upon it, is the system which the public will prefer.

The £ sterling is the unit adopted in all existing marriage settlements, wills, deeds, &c. It expresses sums of magnitude with greater brevity and simplicity than any other unit. It expresses a value peculiarly familiar to our minds. It can be subdivided decimally into tens, hundreds, and thousands, without any violent interference with the coins now current. Why, then, change this unit? *Cui bono?*

What we require is not a change of the unit, but for economising calculations and accounts, that it should be subdivided into decimal instead of fractional parts. In lieu of shillings, pence, and farthings, representing $\frac{1}{20}$, $\frac{1}{240}$ and $\frac{1}{960}$ parts, it is proposed to substitute florins, cents, and mils, representing respectively one-tenth, one-hundredth, and one-thousandth parts of the £.

Our money table would then stand thus:—

Mils.		Cents.		Florins.		
10	=	1				
100	=	10	=	1		
1000	=	100	=	10	=	£1

The coins at present in use would represent values in the following proportions:—

		Florins.		Cents.		Mils.
The Sovereign	=	10	or	100	or	1000
½ Sovereign	=	5	,,	50	,,	500
Crown Piece	=			25	,,	250
Half Crown	=					125
Florin	=	1	,,	10	,,	100
Shilling	=			5	,,	50
Sixpence	=					25
New Silver coin to represent				.	.	15
Ditto		Ditto		.	.	10
The penny present coin would represent						4
Halfpenny				ditto		2
Farthing				ditto		1

The silver coins now representing fourpence and threepence, would be replaced by two new silver coins, to represent respectively 15 mils and 10 mils. But as our silver and copper coins are merely tokens, representing a nominal and not an actual value, the former being a legal tender to 40 shillings, and the latter a legal tender to twelve pence only, the present penny, halfpenny, and farthing copper pieces may be denominated, and made to represent 4 mils, 2 mils, and 1 mil respectively.

According to this arrangement, poor men, to whom the farthing is of importance, will get 25 mils or farthings for their sixpence, in place of 24; and as Mr. Wm. Brown, M.P., very properly remarked at the Society of Arts, "they will see it places them in a better condition, inasmuch as a mil would go as far as a farthing in many cases." The currency is decimalised—the unit to which we are accustomed is preserved—and coins now current not interfered with, beyond the substitution of two new silver for two other coins to be withdrawn.

Decimal currency may therefore be at once adopted without confusion, sacrifice, or expense. It is capable of being understood by the meanest comprehension, and considering the facility of calculation that a decimal system of accounts would confer, it is marvellous that so much discussion and time should be considered necessary to reduce it to practice.

The importance of this subject to the public at large is my apology for troubling you with these remarks.

Yours, &c.,
JAMES S. TRIPP.

Kew Green, March 7, 1855.

THE DISCUSSION ON DECIMAL COINAGE.

SIR,—You are aware of the grounds on which I did not at once comply with the wish expressed in your note, that I should furnish a statement for insertion in the *Journal of the Society of Arts*, recording my views on the Decimal Coinage question, with reference to your recent discussion. This discussion seems to have, unfortunately, wandered off into points not properly before the meeting, particularly into that *modification*, suggested by Mr. Minasi and Dr. Gray, of the simple scheme of substituting the tenpence for the twelvepence as the legal form of account, which I proposed about eighteen months ago, on the first appearance of the Parliamentary Committee's Report, viz., the entire abandonment of the pound as a money of account for what it was proposed to call an imperial, ten tenpences, or a hundred pence, in amount. *Mr. Minasi's short unanswerable paper, however, avoided all allusion to this modification which* THEY *had suggested*, and simply brought under discussion, as he had been requested, a comparison between the results of a millesimal division of the pound into the proposed three new moneys of account, mils, cents, and florins, or, on the other hand, of adhering to all our present moneys of account *and* circulation, (*but one of the former*) so long as found expedient, *by simply abandoning the duodecimal shilling for the tenpence, and keeping all our ordinary accounts in pence and tenpences*, whilst retaining the pound as the legal tender and standard of value, and money of account in unusually large amounts, to whatever extent may be hereafter found convenient. Although Mr. Minasi's comparatively short paper was still further cut down by the chairman,—the advocates of the tenpence had not even the opportunity of a short reply,—fully five-sixths of all that was brought forward being on the part of opponents—the useful figures brought before the meeting by some of these, and particularly by Mr. Franklin, the clear sound positions relative to what is essentially necessary in decimal accounts, laid down by Mr. Hugo Reid, and, above all, the way in which, throughout the discussion, judgment was allowed to go by default, with reference to the unanswerable grounds on which it has been again and again shewn that the proposed *millesimal* division of the pound *is impracticable*, render the discussion highly useful and effective in the promotion of a sound, simple, and comprehensive decimal system.

In the first place it was not even attempted, by either the writers or speakers in defence of the pound and mil scheme, to deny or to meet the weightiest of those decisive, and, it will be found, wholly insuperable objections, rendering impracticable that mode of proceeding, in the opinion of parties of the highest authority, including members of the Decimal Association itself, and of the Committee of the House of Commons, as well as such organs of public opinion as the *Times* and the *Liverpool Mercury*. To several of these objections attention was called by Mr. Headlam, the member for Newcastle, in his evidence before the Committee, and they were fully stated in my first pamphlet, and are shortly given, pages 8 to 20, of the second "Comparative Statement of Different Plans of Decimal Accounts and Coinage."* In the second place, positions laid down as obviously *essential* in the introduction of a decimal system of money and accounts by Mr. Reid and others, are not only wholly and inevitably contradicted by the pound-and-mil scheme, and every modification founded upon a millesimal division of the pound, but *can only be met, as they are, by the penny and tenpenny form of account.* A "*sine qua non,*" Mr. Reid says, is that there shall in any decimal system be ONLY TWO moneys of account, the lower of the two sufficiently low to express with convenience all ordinary money transactions; and another *advocate of the millesimal division of the pound* justly observes that, "there seems little likelihood that while the Americans and the French have *unsuccessfully* attempted to introduce *three* coins of account, we in England should be satisfied with the comparatively complicated system of *four.*" But in order to escape this unhappy peculiarity of the pound-and-mil scheme, Mr. Reid proposes to *banish its pound,* not merely in *ordinary* money transactions and accounts, as on the penny and tenpenny plan, but *altogether*, and, also, its hundredth, the cent, which, being nearly 2½d. in amount, is certainly *not* a coin "sufficiently low to express all ordinary money transactions." Accounts would thus be kept in amounts of 2s., and the one hundreth of 2s. (that is the $\frac{24}{25}$ of the penny); two moneys of account *not even decimally united;* for, although 100 is a very useful "power of 10," *it certainly is not* 10, whilst the 100th of 2s.; so far from being a convenient money of account to express all ordinary money transactions, it is *less than the farthing*—the introduction of which into ordinary accounts *is protested against by men of business as an intolerable inconvenience;* and all that the *humblest* classes require is evidently only those more exact (less than farthing) *measures of value* so simply and admirably provided by the decimal *coins* of the penny and tenpenny form of account. Subdivisions these, too, equally perfect, and superior to the proposed millesimal (as demonstrated by Mr. Laurie and Mr. Minasi) in furnishing commercial equivalents and expressions, and for the most practically convenient arithmetical forms. Against this beautifully simple and efficient mode of proceeding, what, then, have the partisans of the complicated, clumsy, even if practicable, proposition of a millesimal division of the pound, to object? That to keep accounts in the proposed *perfectly decimal form* of pence and tenpence, would not be found convenient; for that, if it had been convenient, accounts would have been so kept, there being nothing to hinder their being so kept, as the advocates of this form have already had all they ask—a tenpenny silver coin in Ireland, and its equivalent in the silver 4d. and 6d. in this country. To these *assertions*, alike unsupported and entirely unfounded, it is sufficient to oppose the long European *experience*, as well as that of every traveller in Europe, of *this identical proposed form of account*—a tenpenny money of account, decimally divided,—as found and unanimously agreed to be *the most convenient and useful of all possible forms of account.* Whilst so far from its advocates in this country having ever had what they ask,—and have asked from their first proposal of *this* mode of proceeding eighteen months ago, the sanction of the law of the land to their proposed form of account—that, "*at option*, pounds, tenpences, and pence, or simply tenpences and pence, should be the legal forms of account"—*this* enactment would *at once* have substituted the decimal for the duodecimal addition in *all* accounts, thrown *all* accounts *up to the pound* into the above *perfect* decimal form, and given *in all* the simple means of adopting individually this same perfect form to whatever extent, and as found convenient—*not an existing coin having to be withdrawn until worn out, and gradually replaced by a more convenient and uniform coinage.* All that the French, Belgians, &c., want, we have—not merely gold coins, like their Napoleon and 25 franc Leopold, (corresponding so closely in value with our sovereign and old guinea,) but a large *money of account*, such as our pound, for the convenient expression of cumbersome very large amounts; and when this is introduced, as it probably will be very shortly, instead of the great commercial country of the world having to give away, (as assumed without the slightest foundation,) in *all* the changes required to secure international uniformity of accounts and coinage, if England is only prepared by the above simple decimalisation of her own, the far greater probability would be that other countries, in which the standard is already practically gold, though professedly silver, would, like this country, also adopt gold as their standard. At all events, the alleged "danger to *our* standard of value from the pretensions of the tenpenny unit," is preposterous, and utterly without foundation. Mr. Yates, indeed, seeking similar objects and results, *by an entirely different mode of proceeding*, the adoption of the "système métrique," and consequent abandonment of all our moneys, weights, and measures, for the French, does, as stated, suggest that "*perhaps* it would be indispensable to adopt silver as the standard of value," as in France. But *my* proposition never involved, or can involve, the slightest alteration of the present standard of value, the 10d. being, as at present, in value, a 24th, and the penny a 240th of the *legal tender*, and, of course, *measure of value.* Whilst *in accounts* our penny *has been found by long experience, so much the most convenient, and the sufficiently low coin of account to express our ordinary money transactions*, that it has wholly banished from them *even halfpence*, and still more, of course, any so intolerably inconvenient as farthings, or the still smaller proposed mils; and, on the other hand, its *only possibly really decimal ally*, the tenpence, has been *experimentally* shewn to be *a sufficiently high money of account* for all ordinary use and convenience in current accounts. A *real* alteration of the present standard of value in this country, and very considerable deterioration of the standard fineness of our gold, without after all rendering it uniform in fineness with that of our neighbours, is, indeed, proposed in page 59 of the pamphlet which the *pound and mil Association* are urging the friends of decimal coinage to subscribe to circulate, and this deterioration has been most anxiously urged by the most active members of that association, without having been disclaimed by their associates. It surely, then, requires no little hardihood for *these very persons* to be the parties to bring such a charge as this in defence and support of their scheme, and to term those "the obstructives" who, after millesimal division of the pound as a means of obtaining a decimal system has been again and again fruitlessly proposed during the last half century, at length *propose* in so short and simple a way, to attain more than, and far more perfectly, all that it has been so long vainly attempted to secure by their opponents' mode of proceeding.

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* Mr. Franklin in his paper speaks of my "manifold writings on this subject," and he and others appear to take their ideas of my proposition from some wholly unknown to myself. All I have ever published are these two pamphlets—"Examination of the Report and Evidence of the Committee of the House of Commons, with Reference to a Simpler, Sounder, and more Comprehensive Mode of Proceeding. Ridgway, 1853." "Comparative Statement of the Different Plans of Decimal Accounts and Coinage. Ridgway, 1854." Price tenpence. With a short preface to the second, and postcript to the third edition of the first of them, and one or two letters and statements like the present, *all strictly and uniformly in support of the same view.* Private correspondence with individuals has certainly been much more extensive, for I found there was scarcely an instance of any one of ordinary candour and intelligence not becoming satisfied of the advantages of this simple mode of proceeding, after a little of this sort of discussion and explanation. My first and most valuable convert was poor Mr. Laurie, who wrote to me the day my first pamphlet was published, and of course after very hasty perusal, to submit what he then considered the objections to my scheme. His views were at first strongly in favour of the pound-and-mil scheme, and his evidence to this effect before the Committee of the House of Commons was highly valued, and full of important information; but he soon became convinced that this scheme was impracticable, and only contended, (as Mr. Reid at present does,) for *that fragment of it* which, dropping the pound, renders the 2s. coin the highest money of account. Then, finding *this* plan still less tenable than the other, he, not only in his letters to me, but on the first public opportunity, gave his unreserved adhesion to my scheme, as he plainly saw, he stated, *that the division of the pound into 24 tenpences, decimally subdivided, was the best selection that could be made, and all that was wanting to render the currency scientific, and to bring it into harmony with foreign decimal systems.* The extremely important commercial and arithmetical results worked out in his last publication, "Practical Analysis of the Comparative Merits of the Pound and Tenpence," and the unanswerable illustrations of the difficulties connected with *the practical arithmetic of the pound-and-mil scheme* in Mr. Minasi's paper, might far more advantageously, and *fairly*, have occupied the meeting than the diversion accomplished by the introduction of that gentleman's suggestion of imperials and argents, to which his paper made no allusion whatever. The suggestion of a coin and money of account of 100d., a ducat or imperial, in place of the pound, was first made by Dr. J. E. Gray, in the preface to the second edition of my first pamphlet, in the most modest and sensible manner, his words to me simply being, "I have read your pamphlet with great care, and agree with you in every part of it, &c.; but would not object (*if it was proposed*) to the ducat of 100 pence, leaving every coin now in use in circulation." Neither of these gentlemen *urge this suggestion* as an essentially important modification, or seek immediate consideration of what is so easily adopted if hereafter found expedient. The *sole* advantage of duodecimal accounts is the number of useful factors, 2, 3, 4, 6, 8; 12, and it would largely compensate for any inconvenience from still retaining the *occasional* use of the 24, as proposed, that this advantage would still be secured.

The pound and mil scheme of a millesimal division of the pound being evidently defeated on *English* ground, an endeavour is perseveringly made to transfer the battle to *foreign*,—although the proposal, whatever its ultimate advantages and results, is, in the first instance, simply the decimalization of our English accounts. The reiterated attacks on my scheme on *this* ground only amount to a reiteration of the well-known fact, that the English tenpence and French franc, (which there has never been any motive or reason for making exactly alike in intrinsic value,) do not, in fact, at present consist of *exactly equal* amounts of silver, and require to be by some arrangement rendered such, in order to become international, and mutually current and exchangeable coins. Whilst, in order to prove that no "slight adjustment" would bring dollars into interchangeable correspondence with five-franc or tenpenny silver coins, the industrious Mr. Franklin travels off *to Hayti* to find a coin which, *bearing the name of dollar*, so little corresponds with the well-known dollar (with which, alike in Europe and America, General Pasley gives evidence that our troops are always paid at exactly five English tenpences, and which at all times so nearly corresponds with this amount and the five-franc piece in intrinsic value) *that this nominal Hayti dollar is actually a coin not containing one third of the silver constituting the ordinary wide-spread well known dollar of America and Europe, the five-franc coin of France, or the five tenpennies of England. I* never suggested that *all* the out-of-the way coinages in the world would, *all at once*, become uniform and corresponding, but simply and solely that with the proposed slight decimal modification of English accounts, the silver coins of the great commercial and influential nations of the world, those using English tenpennies and their multiples in accounts and circulation, and ordinary francs, florins, and dollars, *with slight adjustment* might, and almost certainly would, be rendered strictly corresponding and international, and that with such authority and influence this circulation must in the end become universal in some one or other corresponding form. Mr. Franklin's own figures sufficiently show with *how very slight adjustment* this may be accomplished to the extent suggested as the first great step. Between the 69·43 grains of silver constituting the franc and the 67·27 grains the English tenpence, there is, of course *literally only about two grains of difference*, with a corresponding degree of difference in the dollar, &c., and so far from there being any approach to accuracy in Mr. Miller's extravagantly wild assertions that by the proposed adjustment, I mean "that England should abandon every one of her present measures of value, &c., &c.," it is *not even proposed that she should abandon any one of them whatever.* America has quite recently had to make a very large reduction in the amount of silver in her new issue of dollars, and in the words quoted by Mr. Franklin from the notes on the Annual Report of the Bank of France, if the weight of *their* silver coin is not reduced—that is, brought nearer and more exactly to the weight of our own—"it must inevitably be exported to the last franc." But even if, in return for these large approximations to exact correspondence with our own silver coin, and perhaps also the adoption of our gold standard, we have to consent to some little increase of the present weight of our silver coins, what *imaginable* effect could this have on our "measures of value"? The *silver* and *copper* coins are but the representatives of certain portions of the gold standard of value, and although it is highly inconvenient and objectionable to alter their *actual current value*, by substituting that of mils, or altering the value of the gold sovereign, (as proposed by Mr. Franklin and Mr. Miller, and in the Decimal Association Manifesto,) there is no possible object in having them of any one weight of metal rather than another, but that of avoiding such weights as to induce fraud on the one hand, or melting on the other. Once properly settled by common general consent, there would be no fear of anything so intolerably inconvenient as partial abandonment, or change on any other basis; and even if a general gold standard formed no part of the arrangement, how vast would be the gain to mankind of a strictly uniform and interchangeable silver coinage.

My good friend, Mr. Brown, our worthy and most zealous South Lancashire member, as already more than once pointed out,* is under a strange misapprehension as to his 250 members of Parliament, of the Commissions and Chambers of Commerce, of the Government, and others, who, deceived by the title, have subscribed to his "Decimal Association," being, therefore, by any means, all in favour of his *pound* and *mil* scheme. Few of these have at all considered or made up their minds to *any particular plan of proceeding*; and, of the few who have, there are those who entirely repudiate, and, as repeatedly shown, *who condemn as utterly impracticable this particular scheme.* Mr. Brown states that "the mercantile community of Liverpool have had my views placed more prominently, perhaps, before them than any other town," and appeals to *their* petition in favour of the decimal system, and the pound as the unit; but he has forgotten that *my decimal system strictly preserves the pound as a unit*; and that, not only did he *vainly* endeavour to have a prayer for the *pound and mil* plan of his Committee introduced into the Liverpool petition—this course being successfully opposed *by the member for Liverpool*—but that, quite recently, at the general meeting of the proprietors of the Bank of Liverpool, where he has great and deserved influence, and I am not even a shareholder, on his urging a contribution to what is called "the Decimal Association," the chairman inquired if it really was an association, as it professes, to promote and fairly inquire into decimal coinage, &c., impartially adopting the simplest and most effectual of these two schemes?—and, on its being admitted that the contribution would, in truth be given to support *a mere pound and mil scheme, it was refused without even a division.* If we are ever to have a Decimal System, it requires little sagacity to see that it must begin in the simple way proposed, and that it is of incalculable importance to the world that it should not be delayed.

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* Comparative Statement, pages iii. 90, 106.

THEODORE W. RATHBONE.

Allerton-priory, March 1st, 1855.

PROFESSOR WILSON'S PAPER, AND THE DISCUSSION ON THE IRON INDUSTRY OF THE UNITED STATES.

SIR,—In perusing the paper and discussion on the subject of the manufacture of iron in the United States, given in your last week's number, we are struck with the almost total absence of the details essential to form an opinion as to the respective advantages claimed for England and the Union. The discussion did not turn on practical facts, but on a mass of assertion that political economy must be in favour of America supplying us with cotton and edibles to be paid for in English iron. That coal and iron ore exist in large masses in the Union there seems no doubt, but of the respective qualities of this coal and iron, and their proximity together, of the supply of labour, rates of wages, cost and quality of human food, temperature, and other atmospheric conditions, in short, the mass of conditions of all kinds essential to cheap production, we have little save the general statement, that, west of the Alleghanies, the proximity of the coal and ore is more favourable than in Pennsylvania. Mr. Wilson gives the following statement of the produce in seven districts, and the estimate of cost—I presume on the spot:—

> "1. The Houseatonic district—Production, 10,000 tons; cost per ton, 20 dols. to 25 dols.
>
> "2. The Hudson River district—Production, 80,000 tons; cost per ton, 18 dols. to 20 dols.
>
> "3. The Delaware and Lehigh Rivers district—Production, 120,000 tons; cost per ton, 16 dols. to 18 dols.
>
> "4. The Schuylkill River district—Production, 100,000 tons; cost per ton, 20 dols.
>
> "5. The Susquehanna River district—Production, 100,000 tons; cost per ton, 15 dols. to 18 dols.
>
> "6. The Potomac River district—Production, 125,000 tons; cost per ton, 20 dols.
>
> "7. The Ohio, Cumberland, and Tennessee Rivers district—Production, 150,000 tons; cost per ton, 20 dols.
>
> "Besides these well-defined districts, we must allow about 100,000 tons as the production of the numerous isolated works scattered throughout the upper portions, especially of the Atlantic States, where charcoal as fuel is universally used. In these iron of the best quality is made, but at a cost of nearly double that of the coal furnaces."

I presume this is in pigs. The Houseatonic is the smallest production and the highest cost, averaging 22½ dols., or £4 13s. 9d. per ton. The Susquehanna averages 16½ dols., or £3 18s. 9d. per ton. Now, it would have been of importance to have stated the quality of the iron, and the cause of difference in cost—whether the circumstances were similar to Scotch and Staffordshire, and so on. Mr. Wilson goes on to state:—

> "As long as the price of English iron prevents its importation into the Union under 20 dollars for pigs, and English bar-iron under 50 dols. per ton, the home manufacture can compete profitably with it in their markets, and the iron industry of the States will flourish and increase. Any fall in the English iron that would bring down its price in the American markets lower than the sum quoted would immediately check their home production, and again throw them on our markets for their supplies. The difference in price between the two markets may be taken at 80 per cent. This includes all charges for freight, commission, insurance, &c., about 50 per cent., and the *ad valorem* import duty of 30 per cent. In round numbers, pig iron selling at Liverpool at 45s. to 50s. will cost 20s. at New York. Thus the ironmasters of the States possess a *natural protection* of 50 per cent., which will always remain, and an *artificial* one of 30 per cent., which, like all fiscal charges, is liable to be changed."

This statement is not very clear, but I presume it means, that pig iron selling at Liverpool at 45s. and 50s., will cost 20s. more in charges to get to New York, making it 65s. and 70s.

Even on this showing there would be a profit left on the cost at the Susquehanna district, from which there is freight to pay to New York; and if it be practicable to pay freight for American ores from New York, as Mr. Wilson intimates, as ballast, English pigs can also go as ballast *to* New York. Mr. Wilson's statement of the cheap rate of transit inland, from New York to Chicago, 1500 miles, for a ton for 3½ dols., is certainly remarkable—a ton carried 4¼ miles for one halfpenny—but it is quite clear that this is as much in favour of English imports as American exports.

So long as the American legislature levy 30 per cent. on foreign iron, we must suppose they fancy there is a good reason for it. Either it is for revenue or for protection. If for revenue, they would get more by lowering the duty. If for protection, it is clear that their consumers are a minority in power, or they would not tax themselves for the benefit of American ironmasters.

Mr. Wilson's arguments went to shew that, in his opinion, the American ironmasters were shrewder than the English, and managed their business better; and that their wages were not higher than in this country. Had Mr. Wilson stated the wages specifically, and what amount of food and raiment could be bought with them, and had the English masters done the same, we might have been enabled to judge, and then have gone to the further inquiry how many days work a man could achieve without sickness in the respective countries.

Mr. Wilson gave a favourable description of Renton's patent process of making "blooms" direct from the ore, instead of by the ordinary process of smelting and puddling, and gave some good chemical reasons why it ought to be better, though the English ironmasters dissent from it, on the score of cost.

Mr. Campbell, of New York, gives us a statement on the subject:—

> "In the United States the difference averaged about 25 per cent. in favour of the Renton process. At Newark, New Jersey, a ton of bloom was made at a cost of 29 dollars, a large portion of which was paid for the raw materials, the ore and coal being remote from the works, and subject to expensive transportation. The quantity necessary to make a ton of blooms cost about 10 dollars each, making 20 dollars, which left 9 dollars for labour and all other expenses. Of course, in localities where those materials were cheaper, iron, by this process, would be made at a corresponding reduction in cost. In reference to the manufacture of iron generally in the United States, he would remark that the prominent difficulty in the minds of several gentlemen appeared to be the transportation of the article from its insulated position to a market at the seaboard. At present, and probably for years to come, the Western States would require the largest proportion of iron consumed in that country, and the fact was overlooked that iron manufactured in the interior was, in most cases adjacent to the channels of navigation, and already half the distance from the seaboard to its destination and place of consumption in the west, while English rails landed at New York had to pass through the same channels, double the distance, and at a corresponding increase in cost of transportation. American rails were generally very much superior in quality to English, and were invariably preferred for curves, and all places requiring the best iron; and such was the desire for these rails that the manufacturer found a ready market at his own furnace for all he could produce. In reference to the inability of Americans to compete with the English in this department of industry, Professor Wilson had very properly remarked, 'that they had not the necessary capital,' and he would add, that America was comparatively a young country, with a rapidly increasing population, and a large portion of her capital was

employed in opening up channels of navigation and communication for developing the vast resources of the great west."

So on the seaboard of New York the material for a ton of bloom costs 20 dollars, or £4 3s. 4d., and on the bloom, £6 0s. 10d.; and be it remembered that a bloom is neither a rail nor a merchant bar, but needs still further cost of conversion. It is puzzling to understand why this process of Renton's is not performed direct in the Susquehanna district, to transport the blooms as rails or bars only, and save the cost of transporting the coals and the ore, with the materials of slag.

We can understand that iron produced on the spot where it is consumed, many hundred miles inland, may be cheaper than importing it from England, but there is a discrepancy between the statements of Mr. Wilson and Mr. Campbell as to transit—the former stating its cost at 4½ miles for ½d., and the latter complaining of "expensive transportation."

The cost of producing iron—other things being equal—is really a question of labour. If the quality of ores and coal are the same, the next consideration is the question of climate. That climate will be best which is neither too hot nor too cold, too moist nor too dry, but with sufficient variety to stimulate the body to work, and, in short, keep the human body in the most perfect state of health. It is possible, that as time runs on, an artificial climate may be produced to temper the cold of winter and the heat of summer, but as to obtaining the greatest amount of labour from men in an intensely cold winter, and with a summer of 130 to 140 Fahrenheit, it is out of the question. It is quite true that people can be found to work, for good wages, in a bad atmosphere, rather than starve in a healthy atmosphere; but, on the whole, people will congregate most where, though wages be moderate, their health is good. With a good climate, abundant food, and favourable circumstances, the numbers multiply rapidly, and, probably, were the artificial circumstances equal to the natural, there is no place in the world more favourable to population than England and Wales. The population that feeds the labour market of the States is Irish and German, rushing out of misery to comparative comfort; but the time may come when the tide of industry may roll eastward instead of westward, and it is doubtful whether the United States will then "fill up their numbers" so rapidly. The pallid cheeks of the States are more akin to the indigenous non-working red man than to the hardy, fresh-coloured industry of England, and there seems no present reason why these circumstances should change. The probability is, that the industry of the States will find employment in other things than iron, and that the industry of England in iron will go on increasing. Even supposing the climate of America favourable, it is clear that, with coal and iron almost on our sea's margin, our transit must always give us the advantage in the world's market.

In the course of the discussion it was stated that the iron and coal of America were above the water-level. If so, it is a question of machinery and cost in pumping, which may be of far less importance than an unfavourable climate and long transit.

A charge was brought against the English ironmasters of inertness in the progress of improvement as compared with American ironmasters. We think this arises chiefly from circumstances. Labour is comparatively plentiful in England, and labour-saving processes are not rapidly resorted to. But this will be less and less in future, as knowledge grows and education goes on. And if the quality of the American ores be so far superior as to pay for freight, they may ultimately be brought to the English coal and climate.

Chemically considered iron is a simple substance. In the state of ore it is in some conditions mixed with oxygen, sometimes with other matters. Fortunately for us it is not found pure metal, like gold, or it would be difficult to get it. The more numerous the ingredients in the iron ore the greater probably will be the cost of separation. If the smelting process tends to incorporate them we shall have iron from some ores inferior to that from others. It is, therefore, very important to ascertain whether Renton's process of burning away the oxygen does not enhance the cost, and also whether it be not practicable to mix other ingredients to neutralise such chemical agents as damage the quality of the iron. There is also to consider whether the process of Mr. Nasmyth, rendering the iron porous, with bubbles of steam in the puddling furnaces, is not cheaper than Renton's, and more convenient; and also whether a further process of chemical injection, by means of the steam, may not be applied. In the course of the discussion Mr. May adverted to the inferior quality of English rail iron in the present day, as compared with rails made at the commencement of the railway system, and deprecated the competition called for by railway directors. There are two circumstances to consider in this. Without competition improvement could not exist; there would be utter stagnation. With competition there needs some specific mode of ascertaining quality. Rails, as originally made, cost more than merchant bars; they were much of the same quality of iron, and required heavier blooms. The inconvenience of making a heavy bloom has to be set against the labour of reducing into thin bars of greater number. The original rails, being of light section, yielded under the pressure of the wheels, and where thus saved from abrasion. But this was at the cost of increased haulage prices. To prove effectually the quality of iron, it should be fixed on rigid supports. This test it undergoes in the tyres of locomotive wheels, for which the iron of Yorkshire is better adapted than the iron of Staffordshire, and even the best Yorkshire tyres tread out or squeeze under the loads of modern locomotives. Were the iron of rails laid as solid on the bearings as the tyres are laid on the wheels, it would be found that the rails also would tread out faster than they do at present. What is required to effect the purpose which should be held in view is, rails vertically and laterally rigid—as rigid as the tyres—and laid on such a structure as will absorb vibration. To accomplish this much heavier rails are needed than have been as yet applied, and the wearing surfaces of such rails will probably come in time to be hardened steel, representing as nearly as possible a continuous bar. But there is a limit to the capacity of even hard steel to bear weight without crushing, and sooner or later the limit of weight on wheels must be determined considerably within the ultimate power of resistance. If great weights are needed on wheels, the width of rails must be proportionately increased up to the point where inconvenience outweighs advantage. Chilled cast iron surfaces would be the best were there any mode of preventing brittleness and crumbling at the joints.

With regard to the quality of the metal in rails now manufactured, it is obvious that the sectional form must have something to do with it. If the test of skill in an ironmaster's foreman be, what proportion of cinder he can cover up with a cortex or crackling outside, it is clear that he will succeed better with a double I than with a bridge rail, as being thicker metal. The plan of putting hard granular metal on the surfaces is of very dubious utility, for it breaks away in fragments, and soft fibrous metal does not answer, for it laminates. In examining rails long in use they will be found of a curved form in their length, rising in the middle, the rolling action of the wheels elongating the upper surface. If the surface were hard enough this would not take place. If the upper surface were converted into hard steel, while the lower portion were tough fibrous iron, and the rails of sufficient width and depth, the result would probably be the best quality of rail, while the centre might be left nearly like the structure of a bamboo cane. But even then the modes of securing the rails and connecting them together would be an important consideration. If the joints be so hard as to produce a knock with the wheels, destruction must rapidly ensue, however good might be the material. I am, Sir,

Yours faithfully,
W. BRIDGES ADAMS.

SIR,—The discussion which ensued upon the paper read by Prof. Wilson at the last meeting of the Society, shows that there is a large degree of interest felt in ascertaining the progress of the United States in their iron manufactures. The rapid increase of population in the States—at the rate of more than three per cent. every year—the extension of railroads to distant quarters of the country, and the enormous demands for iron for general purposes, are more than can be supplied for many years to come by the home production; and we may, therefore, confidently reckon upon a profitable market in America until her manufacturing interests have made greater headway than they have yet done. A few added facts to those given by Prof. Wilson will, perhaps, be acceptable in certain quarters, respecting the growth of the iron trade and manufactures of the United States.

In 1816 there were 153 furnaces, producing 54,000 tons of pig iron. In 1845 there were 540 blast furnaces—averaging 900 tons each annually—yielding 486,000 tons; and 950 bloomeries, forges, rolling and splitting mills, yielding, of bars, hoops, &c., 291,000 tons, and of blooms, castings, machinery and stove plates, 151,500 tons, making that year an aggregate of 929,100 tons, of the value of 33,940,500 dols. (about £6,800,000). About 30,000 men are stated to be employed in iron casting—25,000 in the manufacture of pig iron, and 14,000 on wrought iron.

According to the American Census returns of 1850 there were 377 establishments engaged in the production of pig iron. Of these, 180 were in Pennsylvania, 35 in Ohio, 29 in Virginia, 23 in Tennessee, and 21 in Kentucky. The remaining States have a smaller number.

Pennsylvania, the principal iron state, has the following works in ten counties:—

Berks County has	44	Ironworks.
Lancaster	30	„
Clarion	30	„
Huntingdon	28	„
Blair	27	„
Chester	25	„
Venango	21	„
Columbia and Montour	20	„
Centre	20	„
Armstrong	18	„

The capital invested in the manufacture of pig iron in that year in the States was stated at 17,348,000 dols., (nearly £3,500,000); the value of the raw material consumed, 7,000,000 dols.; cost of labour, 5,066,000 dols.; value of the entire products, 12,749,000 dols.; 645,242 tons of mineral coal, and 54,000,000 bushels of coke and charcoal were used.

In Tennessee the iron interest principally centres about the Cumberland river, and the following is a statement of the capital employed, and the produce:—21 furnaces, yielding 29,200 tons metal; 9 forges, 10,600 tons blooms; 2 rolling-mills, 4,700 tons of iron—total, 44,500 tons. Capital, 1,250,000 dols.; value of the products, 1,678,000 dols. Hands employed, 1,395 white men, and 1,810 negroes.

In the manufacture of iron castings, 1,391 establishments were engaged in 1850, employing a capital of about £4,500,000 sterling. The value of the products was about £5,000,000, 322,725 tons of castings being made. 323 works were in New York, 320 in Pennsylvania, and 183 in Ohio; the remainder being scattered in twenties and thirties in other States—Massachusetts having the next largest number, 68. The value of the raw material, fuel, &c., used was estimated at £2,100,000, including 2½ million bushels of coke and charcoal, 191,000 tons of mineral coal, 345,553 tons of pig iron, 11,500 of old metal, and about 10,000 tons of ore. The cost of labour engaged was estimated at 7,000,000 dols.

There were 422 works employed on wrought iron. The principal of these were situated in the following States:—131 in Pennsylvania, 60 in New York, 53 in New Jersey, 42 in Tennessee, and 39 in Virginia. These 422 works gave employment to a capital of £2,800,000. They made 272,044 tons of wrought iron, and used 254,500 tons of pig metal, 33,344 tons of blooms, 78,767 tons of ore, 527,000 tons of mineral coals, and 14,500,000 bushels of coke and charcoal.

The comparative imports and production of iron in the United States may be given as follows:—

	Imports.	Production.
1830	—	165,000 tons.
1840	80,866 tons.	286,903 „
1842	100,055 „	230,000 „
1846	69,625 „	765,000 „
1850	441,514 „	564,755 „
1851	341,750 „	413,000 „
1852	501,158 „	500,000 „

In 1821, the value of iron imported into the United States was 1,213,000 dollars, and for the next ten years the imports scarcely ever reached 2,000,000 dollars in value. In the next ten years, the imports ranged from 4,000,000 to 5,000,000 dollars in amount. The imports fell off until 1848 and 1849, since which they have been largely on the increase. The values of the bar and pig iron imported in 1850 was 9,254,512 dollars; in 1851, 9,113,862 dollars, besides manufactured iron to the value of 8,183,143 dollars.

The subjoined statement, from the *United States Mining Journal*, shows the value of iron, and articles which are wholly or in part composed of iron, which were imported into the United States in 1852:—

	Dollars.
Pig iron	1,142,717
Railroad do.	10,650,191
Manufactures of cast	1,219,202
„ wrought	3,460,112
„ not specified	2,319,280
Cutlery	1,607,158
Other manufactures composed of steel in part	916,889
Old and scrap iron	311,444
	21,626,993

= about £4,325,400.

In the past two years the American imports of iron and iron manufactures have been even larger, and, according to Professor Wilson, the consumption of iron in the States is now fully 1,200,000 tons; of which they are dependent for one-half on the iron-furnaces of this country. Moreover, it appears clear from the general remarks of the speakers that the irregularities of climate, want of ample capital, and the great distances from market, must long prove serious drawbacks to cheap and extensive production of iron in the United States commensurate with the increasing local demand.

Yours, &c.,
P. L. SIMMONDS.

5, Barge-yard, City, March 5th, 1855.

SIR,—As the limits of the meeting last night precluded any further observation being made on the highly interesting paper read by Professor Wilson, and as you afterwards requested me to commit to writing what I know of one of the processes mentioned in the paper, but which was not at all discussed, I venture to send you a few general remarks, such as I should have stated verbally had an opportunity presented itself. In the first place, I quite sympathise in the remarks which fell from Mr. May as to the slowness with which some iron makers avail themselves of manifest improvements, even when they have unquestionable data to go upon, in the vicinity of their own works, as instanced in the use of the gases from the blast furnaces, whereby some firms would effect a saving of more than a thousand tons of coal per week! but, the fact is found in this, that, while prices are high, it is "make! make! get through as much work as possible"—and, when prices are down, then the plea is, that the diminished profits will not afford any increased outlay; so that any discovery, no matter how fair its prospects, is laid aside, until some one, more far-seeing and spirited than the rest, takes up the matter in earnest, and shows, by his contracts, that he is enabled by such improvements to undersell his less spirited opponents.

With regard to the new method of making wrought iron direct from the ore, it appears to possess many very important advantages—such as saving nearly all the cost of casting the ore into pig metal, that is, avoiding a large amount of engine power, the cost and carriage of limestone, and the whole paraphernalia of the blast and refinery furnaces; thereby reducing the make of iron to the simple operation of pulverising the ore and coal, and placing it in an inexpensive chamber, at the end of each puddling furnace; and there the *waste* heat is said to be sufficient to bring down the ore in a state fit for immediate balling or puddling. Surely, a system so beautifully simple in itself, combined with the no small probability of obtaining chemical changes in the iron so made of a highly beneficial character, deserves a speedy and fair trial.

Mention (only) was made of the conversion of slag into useful purposes, as carried out by Dr. Smith, of Philadelphia. Being an eye-witness to a series of interesting experiments which were made by that gentleman at the Dowlais Ironworks, a few months since, I may remark that, like the other American invention just alluded to, this is also simple in the extreme, and consists in nothing more than running the molten slag, as it comes from the mouth of the blast furnace, into rings or moulds (the same being somewhat heated), and when the slag so run is "set" sufficient to be removed from the mould, it is immediately transferred to an annealing furnace, which is kept at a bright red heat until the furnace, or oven, is fully charged. After this it is brought up to a higher degree of heat for a few hours, and then all apertures are hermetically closed, and remain in this state until the oven and its contents are lowered to the temperature of the surrounding atmosphere, or nearly so, thus occupying some four or five days in the cooling. The articles inside are then removed, and that which is, under ordinary circumstances, a weak, brittle, substance, is then found to be a strong, compact, devitrified mass, peculiarly beautiful and varied in colour, and bears a polish much superior to the best descriptions of marble. Such is, in a few words, the process referred to; to what extent it will be made useful remains yet to be seen. That *this* is important to the ironmaster, no one can doubt, when it is borne in mind that for every ton of iron as now made, there is little less than three tons of this material (some eight or nine millions of tons annually throughout the kingdom), which is not only *useless*, but is attended with enormous cost for removal and "tipping." When these things are taken into account, besides the no less important consideration that the material is to be had in the very state it is wanted (the molten state), without any cost whatever for the operation, I say it does seem a matter of immense moment whether this long-lost-sight-of material should not at once be converted to some of the useful purposes in this country to which the talented gentleman referred to has successfully applied it on the other side of the Atlantic, that is, for paving, &c.—rough cast for common purposes, and polished for halls and the like.

Should the subject be renewed at any time I shall be happy to go more into detail than the hurry of this moment admits of.

Your's faithfully,
R. DAVISON.

33, Mark-lane, March 1, 1855.

THE SEWAGE OF LONDON.

SIR,—As the "Value and Use of the Sewage of London" is again to be discussed on the 19th inst., it may help to confine that discussion within more reasonable limits, if the actual points of difference between the two parties are briefly defined.

Mr. Chadwick and his followers attach a very high value to London sewage. Mr. Ward calls it "a mine of Peruvian guano." Mr. Mechi intimates that it is worth "half of thirty-seven millions sterling" (viz., the cost of feeding London), and compares the value of the excrement of one thousand human beings to that of one thousand sheep.

Satisfied of the fertilising elements of London sewage, Mr. Chadwick goes further, and maintains that liquid sewage is the most economical fertiliser that can be applied to any crop on any soil; that the results would produce a profit which would repay the cost of large special expenditure in machinery for distributing the fertilising liquor at the distance of 12 miles round London. Mr. Mechi hopes to supersede the use of Peruvian guano with the contents of London water closets and the drainage of London kitchens. The holders of these opinions refer in support of them, to China, where pure night-soil is the chief manure; to the little peasant farms of Belgium, where night-soil and liquid manure are both employed with considerable skill; to the Edinburgh water meadows; to the now "piped" farms of Messrs. Telfer, Kennedy, &c.; and lastly, to the experiments recently made by Mr. Cuthbert Johnson with the soil of his house applied in a liquid form to the sixth of an acre of grass land. Finally, perfectly satisfied with these results, and with calculations that liquid sewage can be delivered at 2d. per ton 12 miles from London, the Board of Health school propose to sink a million or so in plant, and undertake the expense of pumping the whole sewage of London to the rural districts, feeling confident that it can be profitably retailed at prices which will more than repay the whole cost of plant and pumping.

Mr. F. O. Ward goes a step further, and is so satisfied of the value of the London guano that he proposes to execute a set of drains for its preservation in a pure state, undiluted by rain-fall and street washings. Every house is to have one set of pipes for its roof gutters, and another for its sinks and water-closets, while in every street the main sewers are to be given up to water only, and a new set of tubular drains are to be provided for night-soil, to be diluted with enough of water to wash it down to the reservoirs, where pumping engines are to raise it, and drive it all over the country.

Dissenting from the views of Mr. Chadwick and his pupils, are a number of agriculturists, chemists, and engineers of the first class, who agree in the desirability of thoroughly freeing London and the Thames from the pollution of sewage, but who doubt whether the value of the article will repay any extraordinary expenses incurred in pumping, &c., and who consider the advantages of concentrated portable manures like guano and superphosphate quite beyond the reach of competition.

First, as to abstract value. Mr. Lawes, after a series of most elaborate analyses, estimated the value of the excrement of London ("supposing it were possible, which it certainly is not, to separate the constituents of fertilisation from sewage"), at upwards of £700,000. But this manure, even in the freshest state, "contains 94 per cent. of water," and is forthwith diluted with water supplied by the water companies at the rate of at least 20 gallons per head, and rain-fall of 24 to 25 gallons more. So that Mr. Lawes estimates that a ton of sewage would contain nine ounces of excrementitious matter. Mr. Chadwick disputes this estimate, in which be says, no allowance has been made for soapsuds and dishwashings. If doubled, to 18 ounces, it will still be a very thin liquor, requiring for its accommodation and conveyance vast space as compared with guano, or artificial mineral manures.

The agriculturists follow the chemist, and maintain that sewage water, strong or weak, can only be advantageously applied to grass crops; that if it can be conveniently carried to fields near London, where green crops are wanted, it may be usefully applied at the rate of not much less than 10,000 tons to the acre. The evidence against the employment of liquid manure of any kind to cereal crops, is found in the fact that Mr. Littledale, of Liscard, near Liverpool, Mr. Telfer, Mr. Kennedy, and other Scotch farmers, who have adopted liquid manure, distributed by iron pipes, for the cultivation of Italian rye-grass, have not thought it advisable to use it for corn crops or root crops on their farms. That the Lombard and Piedmont farmers, who have the use of pure dung, and liquid manure from their stall-fed cattle, to a large extent, who perfectly understand irrigation, and largely employ liquid manure to green crops, carefully refrain from applying either liquid manure or sewage to cereals, although nothing would be more easy than to turn the solid manure of their stables into irrigating channels; that the Belgians are compelled to make more use of night soil than our farmers, because of the want of those great herds of stock and flocks of sheep which all good farmers keep here, and especially because they have not our commercial advantages in concentrated manures like guano, nitrates of soda, and phosphates. Agriculturists of the first class further urge, that it would be much more economical for farmers who want liquid manure for their green crops to make it with the dung of their stalls, and the contents of bags of guano and barrels of mineral manure, with water that costs nothing, than to buy it at even 2d. per ton; for at 2d. per ton, 10,000 tons, the quantity of sewage which Italian, and Scotch, and Devonshire, and Swaffham experience tells us is not too much, the cost of London sewage, besides the expenses of distribution, would be £83 6s. 8d. per acre. This estimate agrees with the calculation of Mr. Arthur Morse, who considered, from his experience at Swaffham, that the sewage of 1,000 inhabitants, viz., at least 20,000 gallons, might be put on an acre, and would grow 65 tons of Italian rye-grass.

At this point we arrive at the engineers—I mean engineers like Mr. Robert Stephenson, M.P., Mr. Simpson, the President of the Institution of Civil Engineers this year, Mr. Bidder, and others who have devoted their lives to the study and invention of great engineering works. These gentlemen unanimously assert that the estimates of Mr. Chadwick and his friends for works, working, and repairing, are under-estimated by many hundred per cent.

It seems, then, that the only points of agreement are, first, the necessity of sending sewage out of London clear of the freshwater of the Thames; and, secondly, that sewage water applied in sufficient quantity, at proper seasons, will grow enormous crops of grass. On the points of the value of sewage,—of its use as regards the rotation crops of a farmer; of its comparative value as compared with stall, manufactured, or imported manures; the modes of collecting, and cost of distributing, there is a total difference of opinion between the agricultural chemists, the most eminent English and Scotch farmers, and the Institution of Civil Engineers on the one hand, and Mr. Chadwick and Mr. Ward, and their followers, on the other.

I confess, with great admiration for Mr. Chadwick's talents as an expounder of sanitary abuses, and an advocate, I prefer the opinions and experience of chemists, farmers, and engineers, to those of the cleverest lawyers and most eloquent authors.

SAM. SIDNEY.

Farmers' Club, Blackfriars.

MEETINGS FOR THE ENSUING WEEK.

MON. Society of Arts, 8. *Special.* Adjourned Discussion, "On the Sewage of London."
Brit. Architects, 8. Mr. W. P. Griffith, "On the Principles to be observed in Designing Mediæval Decorations and Ornaments with reference to the sources of ornament offered by the Natural Kingdom."
Chemical, 8.
Statistical, 8. Discussion "On the Loans raised by Mr. Pitt, during the First French War, 1793—1801; with some Statements in Defence of the Methods of Funding employed."
TUES. Royal Inst., 3. Prof. Tyndall, "On Electricity."
Civil Engineers, 8. Mr. R. A. Robinson, "On the Application of the Screw Propeller to the Larger Class of Sailing Vessels."
Linnæan, 8.
Pathological, 8.
THURS. Royal Inst. 3. Mr. Donne, "On English Literature."
Numismatic, 7.
Antiquaries, 8.
Royal, 8½.
FRI. Philological, 8.
Royal Inst. 8½. Rev. J. E. Ashby, "On (so called) Catalytic Action and Combustion, and Theories of Catalysis."
SAT. Royal Inst. 3. Dr. Gladstone, "On the Principles of Chemistry."
Royal Botanic, 3¾.
Medical, 8.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 8th March, 1855.

Par. No.	
78.	Statute Law Commission—Return.
98.	Staff Officers—Return.
99.	Committee of Selection—4th Report.
51.	Bill—Lunacy Regulation Act, 1853 (Amendment).

PATENT LAW AMENDMENT ACT, 1852.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, March 9th*, 1855.]

Dated 30th January, 1855.

231. H. D. Pochin, Salford—Compounds of alumina and their application.

Dated 14th February, 1855.

335. J. H. Johnson, 47, Lincoln's-inn-fields—Governors. (A communication.)
337. J. Nichol, Edinburgh—Bookbinding.
339. F. B. Blanchard, Maine, U.S.—Apparatus for generating motive power.

Dated 15th February, 1855.

341. R. Molesworth, Halfmoon-street, Bishopgate-street—Brushes.
345. H. Spencer, Rochdale—Spinning machinery.

Dated 16th February, 1855.

347. W. Spence, 50, Chancery-lane—Substitutes for glass for ornamental purposes. (A communication.)
349. W. Abbott, Richmond—Boot and shoe cleaning machine.
353. F. G. P. M. V. Maneglia, Turin and Genoa—Railway carriages.
355. S. B. Wright, Parkfields, Stone, and H. T. Green, Moreton—Encaustic tiles.

Dated 17th February, 1855.

357. J. Wright, 16, Park-street, Kennington—Consumption of smoke.
359. J. Hackett, Derby—New fabric for umbrellas, &c.
361. J. Oxley, Beverley—Wheels.
363. R. J. Mary'on, 37, York-road—Steam engines.

Dated 19th February, 1855.

365. R. A. Brooman, 166, Fleet-street—Capsules for stopping bottles, &c. (A communication.)

Dated 20th February, 1855.

366. G. Tillett, Clapham—Bedsteads.
367. D. Hulett, Holborn—Heating, cooking, and lighting by gas. (Partly a communication.)
368. S. Bellamy, Torquay—Fire-arms and ordnance.
369. C. R. Mead, Langdale-road, Peckham—Gas regulator.
370. A. L. Thirion, Asche en Refail, Namur—Pumps.
371. H. Schottlander, Paris—Ornamenting looking glasses.
372. S. Kershaw and J. Taylor, Heywood—Carding engines.
373. J. H. Brown, 4, Trafalgar-square—Ball cartridges.
375. J. Worthly, Zoffingen—Preservation of meat.

Dated 21st February, 1855.

376. J. Kidd, Kildwick, near Bradford—Stitching machinery.
377. R. Laming, Carlton-villas, Maida-vale—Purification of gas and obtaining products.
378. B. Goodfellow, Hyde—Pumping machinery.
380. T. Organ and G. Pitt, Birmingham—Dress fastening.
381. G. Nasmyth, Kennington—Preserving animal and vegetable matters.
382. G. Heppel, Preston—Rotary pump and engine. (A communication.)

383. F. W. Norton, Edinburgh—Warp fabrics.
384. J. H. Pidcock, Leighton Buzzard—Propelling and steering vessels.
386. F. Prince, 3, South-parade, Chelsea—Fire-arms and ordnance.
387. W. Maynes, Stockport—Temples to be used in weaving.
388. G. Noble, Sunderland—Fire-bricks.
389. P. Prince, Derby—Patterns for making moulds for railway chairs.
390. C. Low, Bodowen, Dolgelly—Extraction of gold from its ores.

Dated 22nd February, 1855.

391. T. Harrison, Hackney—Composition for ships' bottoms.
392. W. Kirrage, 10, Edmund-street, Camberwell—Consuming smoke.
393. R. Mc Connell, Glasgow—Dressing textile fabrics.
394. J. Bunten and G. Lamb, Glasgow—Cutting and shaping wood.
395. P. Clarke, Manchester—Locomotives. (A communication.)
396. W. Neilson, Glasgow—Locomotives.
397. F. W. East, 214, Bermondsey-street, and J. Mills, William street, Old Kent-road—Destroying noxious vapours from bone-boiling, &c.

Dated 23rd February, 1855.

398. W. Hartcliffe, Salford, and J. Waterhouse, Manchester—Looms.
399. A. Taylor, 21, Duke-street, Manchester-square—Communication between guard and driver.
401. W. J. M. Rankine and J. Thomson, Glasgow—Laying subaqueous electrical conductors.
402. W. H. Zahn, 13, Norfolk-street, Strand—Windmills. (A communication.)
403. N. Bennett, 7, Furnival's-inn—Substitute for scaffolding. (A communication.)
404. J. E. Gardner, Strand—Portable cooking apparatus.
405. S. M. Allaire, Paris—Hats, caps, and bonnets.
406. B. Looker, jun., Kingston-upon-Thames—Ventilating stables, &c.
407. N. Thompson, jun., New York—Life-boats.

Dated 24th February, 1855.

408. V. J. Lebel, J. Fourniol, and J. B. Remyon, Paris—Typographic presses.
409. B. A. Murray, Dublin—Winding silk, &c.
410. J. H. Johnson, 47, Lincoln's-inn Fields—Fountain pens. (A communication.)
411. J. H. White, Manchester—Artificial teeth.
412. J. Player, J. P. Player, and L. D. Jackson, Winchester-buildings—Drying tan peat.
413. J. S. Russell, Millwall—Water ballast for ships.

Dated 26th February, 1855.

414. W. Brown, 113, Albany-road, Old Kent-road—Printing.
415. H. Martin and J. Smethurst, Guide Bridge Iron Works, Manchester—Fencing for shafts, &c.
416. A. E. L. Bellford, 32, Essex-street, Strand—Railway breaks (A communication.)
417. P. A. Merchant, Paris—Grinding mills.
418. A. E. L. Bellford, 32, Essex-street, Strand—Soda. (A communication.)
419. J. W. Spurway, 4, Monmouth-place, New Cross—A travelling pass.
420. A. Brown, Tarbet, N.B.—Paper.
421. C. H. Roberts, 3, Cornwall-road, Stamford-street—Rubbers for painters.
422. T. Nash, jun., 134, Great Dover-road—Brushes and brooms.

Dated 27th February, 1855.

423. W. A. Gilbee, 4, South-street, Finsbury—Alcohol. (A communication.)
424. W. A. Gilbee, 4, South-street, Finsbury—Soap. (A communication.)
425. J. Brodie, Bow of Fife, N.B.—Tongs, pliers, vices, &c.
426. A. J. Berchtold, Paris—Applying photographic engravings.
427. H. Gardner, 7, Arthur-street, Old Kent-road—Horse shoes.
428. J. Cooper, Birmingham—Joiner's braces.
429. B. Fothergill and W. Weild, Manchester—Combing machinery.
430. W. Campion, Nottingham—Knitting machinery.
431. Captain A. T. Blakely, R.A., Little Ryder-street, St. James's—Ordnance.

Dated 28th February, 1855.

436. J. Brickles, J. Thorpe, and J. Lillie, Manchester—Manufacture of fabrics.
438. W. Holroyd, Halifax—Fencing for shafts, &c.
440. J. Gedge, 4, Wellington-street South—Stopping railway trains. (A communication.)
442. B. W. Goode and N. Brough, Birmingham—Fire-arm.
444. E. T. Bellhouse and T. Cowburn, Manchester—Vacuum and safety valves.
446. Lieut. T. Cook, R.N., Addiscombe—Working punkas for agitating air.
448. H. Penney, York-place, Baker-street—Vulcanized india-rubber.

INVENTION WITH COMPLETE SPECIFICATION FILED.

434. J. Reddie, Anstruther, N.B.—Metal shovel. 28th February, 1855.

WEEKLY LIST OF PATENTS SEALED.

Sealed March 9th, 1855.

1988. William Nash and John Jewell, Islington—Improvements in window sashes and frames.
1990. Auguste Edouard Loradoux Bellford, 16, Castle-street, Holborn—Improvements in electro-magnetic clocks.
2001. William Bramwell Hayes, Manchester—Improvements in looms for weaving.
2007. John William Perkins, Poplar-terrace, Poplar—Improvements in purifying gas, the residuum arising from which forms a new artificial manure.
2032. Auguste Edouard Loradoux Bellford, 16, Castle-street, Holborn—Improvements in machines for drilling stone.
2036. Auguste Edouard Loradoux Bellford, 16, Castle-street, Holborn—A new mathematical instrument, to be termed the "Horometer," for the purpose of solving problems in plane and spherical trignometry, one feature of which invention is or may be applicable in the construction of other mathematical instruments.
2068. George Spencer, 3, Alpha-road, New Cross—Improvements in the external coverings of roofs and walls of buildings and sheds, and in the windows of such buildings and sheds.
2076. Jonathan Edge, Bolton-le-Moors—Improvements in pistons.
2139. Thomas Edwin Moore, 3, Great Titchfield-street, St. Marylebone—Improvements in machinery or apparatus for curvilinear and annular cuttings in metals and other hard substances.
2226. Auguste Edouard Loradoux Bellford, 16, Castle-street, Holborn—Improvements in breech-loading fire-arms.
2580. Frederic Jolly, Turton, Lancaster—Improvements in machinery or apparatus for mangling, stiffening, filling, and finishing cotton and other piece goods.
2610. Christian Henry Richard Ebert and Lippmann Jacob Levisohn, Old-street, St. Luke's—Improvements in the mode of rendering certain cases or receptacles extensible.
2688. Robert Walker, Glasgow—Improvements in telegraphing.
2744. James Nasmyth, Barton-upon-Irwell, Lancaster—Improved machinery or apparatus for facilitating the forging of masses of iron.
154. Charles Van den Bergh, Lacken-by-Brussels—Improvements in rotatory steam engines.

Sealed March 13th, 1855.

2023. James Kershaw, Bury—Improvements in looms for weaving.
2045. Henry Holland, Birmingham—Improvements in the manufacture of umbrellas and parasols.
2060. Robert McConnel Glasgow—Improvements in locks.
2089. Charles William Lancaster, New Bond-street—Improvements in fire-arms, and in cartridges to be used therewith.
2127. John Kershaw, Stockport—Improvements in self-acting mules.
2134. Thomas Crossley, Scots-yard, Bush-lane—An improved mode of manufacturing printing blocks.
2141. Enoch Oldfield Tindall, Scarborough—Improvements in mangles and wringing machines for smoothing and wringing clothes and woven fabrics.
2423. James Buchanan, Glasgow—Improvements in the manufacture of heddles or healds for weaving.
2761. Thomas Slater, Somers-place West, St. Pancras, and Joseph Tall, Crawford-street, Marylebone—Improvements in the construction of planes and in cutting apparatus, and in the machinery or apparatus employed therein.
41. Charles John Edwards, junior, Great Sutton-street, Clerkenwell, and Frederick Frasi, Tavistock-terrace, Holloway—An improved manufacture of bearings for carriage axles and shafts of machinery in general.
71. John Norton, Dublin—Improvements in draining land.
79. Auguste Edouard Loradoux Bellford, 32, Essex-street, Strand—Improvements in tanning. (A communication.)
100. Joseph Edlyn Outridge, Constantinople—Improvements in transmitting motive power.

EXTENSION SEALED.

13th March, 1855.

10. Thomas Clark, Marischal College, Aberdeen—A new mode of rendering certain waters (the water of the Thames being among the number) less impure and less hard, for the supply and use of manufactories, villages, towns, and cities.—For seven years.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3692	March 7.	Temple Holder for Power Looms	John Elce and John Bond...	Manchester.
3693	„ 7.	Reservoir Protector	S. Mordan and Co.	22, City-road.
3694	„ 8.	Brook's Patent Glacé Thread and Universal Thread Silk Preserver	Jas. Brook and Brothers ...	Meltham Mills, near Huddersfield.